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AN INTERNATIONAL JOURNAL DESIGNED TO EXPEDITE PUBLICATION
OF RESEARCH ON TAXONOMY & NOMENCLATURE OF FUNGI & LICHENS

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MYCOTAXON

Volume XLIII, pp. 1-7 January-March 1992

VERMICULARIOPSIELLA ARCICULA, A NEW DEMATIACEOUS HYPHOMYCETE FROM SARDINIA, ITALY

Marcella Pasqualetti and Laura Zucconi

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Abstract

Vermiculariopsiella arcicula sp. nov., collected in Sardinia (Italy), is described and illustrated. Some considerations on the genus are reported.

During some mycological researches on fungal populations succession, carried out on *Pinus radiata* D. Don litter in a reafforestation on Mt. Arci in Sardinia (Italy), a new species of *Vermiculariopsiella* Bender (1932) (Dematiaceous Hyphomycetes) has been found.

Vermiculariopsiella arcicula Pasqualetti & Zucconi, sp. nov.

Etym.: from Mt. Arci, where the fungus has been found.

Sporodochia dissita, punctiformia, circumscripta, irregulariter circularia, nonnumquam coalescentia, setosa, conidiis agglutinatis alba. *Mycelium* partim superficiale, partim immersum; mycelium superficiale ex ramosis, anastomosantibus, septatis, levibus, hyalinis, tenuitunicatis, setas et conidiophores ferentibus hyphis, compositum. *Setae* numerosae, erectae, curvae vel modice flexuosae, simplices, septatae, leves, usque ad 600 µm longae et 3,5-6,5 µm prope basim crassae, crassitunicatae, brunneae, gradatim tenuiores tunicatae et pallidiores ad angustiorem et leviter rotundatum apicem. *Conidiophora* macronematosa, fasciculata, erecta, recta vel modice flexuosa, levia, ramosa, hyalina, usque ad 60 µm longa et 1,5-3,0 µm crassa, inter setas densum vallum formantia. *Cellulae conidiogenae* enteroblasticae, mono- vel polyphialidicae, discretae, determinatae, lageniformes, leves, tenuitunicatae, hyalinae, 11,5-22 x 2,0-3,5 µm, leviter inflato collaretto et saepe collulis angustis et longis praeditae. *Conidia* aseptata, levia, hyalina, fusiformia vel modice curvata, basi rotundata cum modice rotundata cicatrice a latere et apice angustiori et leniter rotundato praedita, 15,0-19,5 x 2,5-3,8 µm.

In foliis emortuis *Pini radiatae* D. Don, in monte Arci, Sardinia, Italia, A. Rambelli, 3 Sept.1990, ROHB 137A, holotypus.

Sporodochia effuse, punctiform, circumscribed, roundish, sometimes coalescing to form irregular patches, setose, withish due to sporulation, with conidia aggregated in masses. *Mycelium* partly superficial, partly immersed; superficial mycelium composed of a network of branched, septate, smooth, hyaline, thin walled, hyphae creeping on the substratum, bearing setae and conidiophores. *Setae* numerous, erect, curved to slightly flexuose, simple, septate, smooth, up to 600 µm high, 3,5-6,5 µm wide above the swollen base, thick walled, brown, progressively thinner walled and paler towards a gradually tapering and slightly rounded apex. *Conidiophores* macronematous, fasciculate, erect, straight or slightly flexuose, smooth, branched, hyaline, up to 60 µm long and 1,5-3,0 µm wide, forming a close palisade among the setae. *Conidiogenous cells* enteroblastic, mono- or polyphialidic, discrete, determinate, lageniform, with a flared collarette, smooth, thin walled, hyaline, 11,5-22 x 2,0-3,5 µm, often with a long and narrow neck. *Conidia* aseptate, smooth, hyaline, fusiform to gently curved, with a slightly rounded lateral scar at the rounded base and a narrower and slightly rounded apex, 15,0-19,5 x 2,5-3,8 µm.

Our species presents long unbranched setae and branched conidiophores disposed to form a sporodochial structure (fig. 2a), phialidic conidiogenous cells with flared collarettes and fusiform to

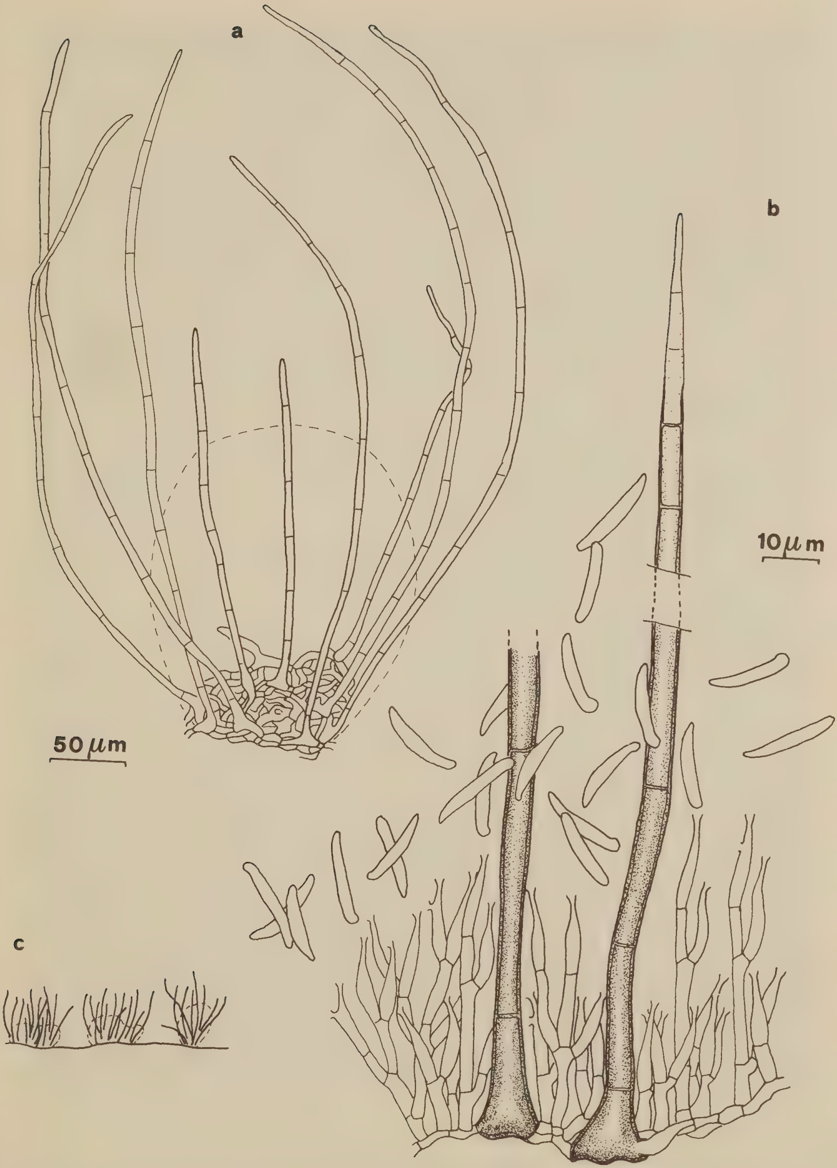

Fig. 1 - *Vermiculariopsiella arcicula*: a, sporodochium with setae arising from a superficial mycelium; b, setae, conidiophores and conidia; c, habit sketch.

gently curved conidia (fig. 2b, d, e). These are the main characteristics that allowed us to include the species here described and illustrated in the genus *Vermiculariopsiella* Bender (1932).

In 1855 Desmazières described the new species *Excipula immersa* on the base of some exsiccata distributed in *Plantes Cryptogames de France* No. 268. Von Höhnel (1918) transferred the species *immersa* in the new genus *Vermiculariopsis* v. Höhnel. Successively Bender (1932) invalidated the genus *Vermiculariopsis* v. Höhnel being a later homonym of *Vermiculariopsis* Torrend and proposed the new name *Vermiculariopsiella* Bender for the species *V. immersa* (Desm.) Bender. On the basis of Article 36.1 of the Code (1988), the english description of the genus reported by Bender, as it was published before 1 Jan. 1935, has to be considered valid. In this diagnosis of the genus the conidia are described as one-celled and, considering this characteristic more significant at the specific and not generic level, we suggest to exclude this limitation in the morphology of conidia; this allows a better inclusion in the genus of *V. falcata* Nawawi, Kuthubutheen & Sutton (1990) characterized by the presence of septate conidia.

In 1990 Nawawi *et al.* re-examined the genus *Vermiculariopsiella*; in this work the authors described two new species and proposed three new combinations. They provided also a key for the known species of this genus. Among the six species they reported, only three, *V. ramosa* (Sutton) Nawawi, Kuthubutheen & Sutton (1990), *V. cornuta* (V. Rao & de Hoog) Nawawi, Kuthubutheen & Sutton (1990), and *V. cubensis* (Castañeda) Nawawi, Kuthubutheen & Sutton (1990) possess branched setae and, for this characteristic, they differ from our fungus. The Hyphomycete here described presents unbranched setae such as *V. immersa* (Desm.) Bender (1932), *V. falcata* Nawawi, Kuthubutheen & Sutton (1990) and *V. parvula* Nawawi, Kuthubutheen & Sutton (1990). It differs from the first-named in the dimensions of setae, which are smaller, and in the different lenght/wide ratio of conidia; it differs from *V. falcata* in the dimensions of setae, which are longer, and in the shape and dimensions of conidia. At last, it differs from the third species in the dimensions of setae, conidiophores and conidia which are all longer. Moreover, the species here described is characterized by mono- or polyphialidic conidiogenous cells. This characteristic has been already observed in *V. cornuta*, previously described by V. Rao & de Hoog (1986) as *Gyrothrix cornuta*, and in *V. ramosa*, previously described by

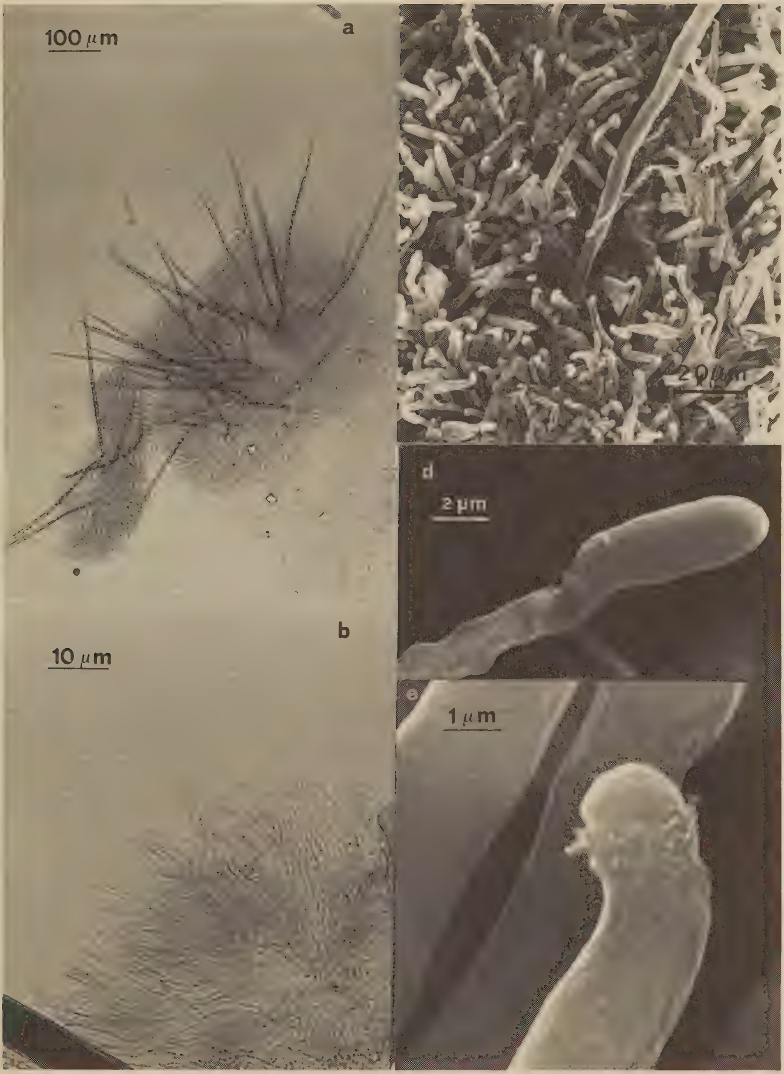
a
100 µm
b
10 µm
c
20 µm
d
2 µm
e
1 µm

Fig. 2 - *Vermiculariopsiella arcicula*: a, spodochium; b, conidiophores and conidiogenous cells; c, aspecte of the colony with seta and conidiophores; d-e, phialides with collarettes and partially emerged conidia.

Sutton (1978) as *Oramasia hirsuta* Urries var. *ramosa*. Even the presence of polyphialidic cells is reported in the specific diagnosis of *G. cornuta*, though it is not explicitly mentioned in the specific diagnosis of *O. hirsuta* var. *ramosa*. The last case is evident from the illustration reported by the author. Finally, sometimes some setae are shorter, just slightly thick walled and pale brown at the swollen base, for the reason that they are not completely developed.

For the above-mentioned reasons we propose *V. arcicula* as a new species. In this species the numerous branched conidiophores, disposed closed one another to form a palisade, are so assembled that it is difficult to distinguish their complete structure. The same is for the morphology of the conidiogenous cells and for the presence of collarette, emphasized only by oil immersion at the light-microscope and by SEM observations. Oil immersion observations show the presence of phialidic conidiogenous cells (fig. 2b) while SEM observations emphasize better the conidia production from the interior of the conidiogenous cell (fig. 2d, e).

The grow rate and the ability to form sporodochia was tested on four different cultural media: PDA, soil extract agar, bean juice agar and soy flour agar (composed by soy flour g.10, Saccharose g.10, Bacto Agar g.15 in 1000 ml. Distilled Water). Sporodochia occurred only on soil extract agar and soy flour agar, but a more rapid growth was observed on soy flour agar. On both these media the previous production of conidial masses to the one of setae was observed.

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References

Bender, H. B. 1932. The genera of Fungi Imperfecti. *Mycologia* **14**: 410-412.

Greuter, W. *et al.* (ed.) 1988. International Code of Botanical Nomenclature adopted by the Fourteenth International Botanical Congress, Berlin, July - August 1987. *Regum Vegetabile* **118**: 1-344.

Höhnel, F. von. 1918. Dritte vorläufige Mitteilung mycologischer Ergebnisse (Nr. 201-304). *Ber. dtsch. Bot. Ges.* **36**: 309-317.

Nawawi, A., Kuthubutheen, A.J. & Sutton, B.C. (1990). New species and combinations in *Vermiculariopsiella* (Hyphomycetes). *Mycotaxon* **37**: 173-182.

Rao, V. & de Hoog, G. S. 1986. New or critical Hyphomycetes from India. *Studies in Mycology* (CBS) **28**: 1-84.

Sutton, B. C. 1978. New and interesting Hyphomycetes from Tampa, Florida. *Mycologia* **70**: 784-801.

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STUDIES IN THE GENUS CLADOSPORIUM SENSU LATO. VI. CONCERNING CLADOSPORIUM VIGNAE, CAUSAL ORGANISM OF LEAF AND POD SPOT OF COWPEA (VIGNA UNGUICULATA) AND LEAF BLIGHT OF LESPEDEZA BICOLOR

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ABSTRACT

A review is made of *Cladosporium* species occurring on members of the Fabaceae in the United States. Comments are offered on the status of the various taxa, together with remarks on distinguishing features. *Cladosporium vignae* M. W. Gardner is redescribed and illustrated from its type specimen on pods of *Vigna unguiculata*, and from a collection made on leaves of *Lespedeza bicolor*. Its characteristics *in vitro*, based on an isolate derived from the latter, are also reported.

INTRODUCTION

A number of species of *Cladosporium* Link have been reported as occurring on members of the Fabaceae [see Farr *et al.* 1989]. Some cause disease symptoms such as leaf, pod and stem spots, while others are associated with conditions commonly referred to as black mold of pods and seed storage rot. Many of the records in the literature identify the implicated fungi to species. It should be borne in mind, however, that, given the ease with which taxa belonging to this genus can and have been confused, it is by no means certain that application of binomials has always been consistent and reliable. During the first half of this century, and even later, inadequate description of taxa has undoubtedly led to numerous misdeterminations so that it is now impossible to know for sure what species were actually encountered in many instances. This type of knowledge breakdown makes the need for improvement in our species concepts and characterization, and thereby refinement of the taxonomy of the genus, all that much more urgent.

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In some instances, records on hosts classified in the Fabaceae are of *Cladosporium* spp., without species determination. Examples of this are reports of *Cladosporium* associated with storage rot of peanut [*Arachis hypogaea* L.] in Alabama (Diener, 1960), on leaves of *Desmodium nudiflorum* (L.) DC. in Wisconsin (Greene, 1956), in reproductive and vegetative structures of soybean [*Glycine max* L.] in Illinois and Mississippi (Jordan *et al.*, 1986; Kilpatrick and Johnson, 1953; respectively), and causing stem lesions and leaf spot of sicklepod [*Senna obtusifolia* (L.) H. Irwin & Barneby] in Florida (Alfieri *et al.*, 1984).

Among species of *Cladosporium* commonly encountered on Fabaceae hosts in the United States, *C. herbarum* (Pers.) Link appears to be the most frequently reported species, followed by *C. cladosporioides* (Fres.) de Vries and *C. elatum* (Harz) Nannf. (Farr *et al.*, loc. cit.). Other species recorded on this host plant family include *C. baptisiae* H. C. Greene, *C. carpophilum* Thum., *C. myriosporum* Ell. & Dearn., *C. piscicolum* W. C. Snyder, *C. pisi* Cugini & Macch. and *C. vignae* M. W. Gardner.

Cladosporium herbarum has been recorded from a wide variety of Fabaceae hosts, in some cases as a pathogen. This species, the type of the genus, is generally regarded to be predominantly saprophytic (see Ellis, 1971; McKemy and Morgan-Jones, 1991b). Some question can, therefore, be raised about the accuracy of at least some of the records of its occurrence on this host family. As indicated elsewhere (McKemy and Morgan-Jones, loc. cit.), further work is required before consistent and valid application of this binomial becomes possible [see also Prasil and de Hoog (1988)]. It is reported in Anon. (1960), and by Alfieri *et al.* (1984), as the cause of black mold of peanut pods, a similar condition to that which it causes on inflorescences of cereals in the southeastern United States, referred to as 'black head mold'. Other records of its occurrence include ones on lentil [*Lens culinaris* Medik], where it has been isolated from roots, stems and leaves in the Pacific northwest (Wilson and Brandsberg, 1965; Shaw, 1973), and on lima and French beans [*Phaseolus lunatus* L. and *Phaseolus vulgaris* L.], where it reportedly causes pod and seed spot (Anon., 1960; Alfieri *et al.*, 1984; Shaw, 1973) in a number of states. There are also reports of its occurrence on leaves, pods and seeds of English pea [*Pisum sativum* L.] (Anon., 1960; Cash, 1953; Shaw, 1973) and soybean (Miller and Roy, 1982), and as the cause of a leaf spot of black locust [*Robinia pseudoacacia* L.] (Anon., 1960; Stipes and Davis, 1972).

Cladosporium cladosporioides has been reported from Hawaii (Baker *et al.*, 1979; Raabe *et al.*, 1981) on leaves of koa [*Acacia koa* A. Gray var. *koa* and *A. koa* var. *hawaiiensis* Rock] and from Oregon on alfalfa [*Medicago sativa* L.], and a number of clovers [*Trifolium hybridum* L., *T. incarnatum* L., *T. pratense* L., and *T. repens* L.] and vetches [*Vicia sativa* L., *V. villosa* Roth.] (Shaw, 1973). *Cladosporium elatum* was also reported on some of the latter hosts, and both species were recorded on English pea in Oregon, with *C. cladosporioides* causing so-called '*Cladosporium* blight' (Shaw, loc. cit.). Whether or not the records of *C. elatum* are reliable is open to question since this species is known mainly from wood pulp and dead conifer wood in Europe [see de Vries, 1952; Ellis, 1971].

The remaining species of *Cladosporium*, or taxa originally described in that genus, known to occur on the Fabaceae in North America are restricted to one or a few hosts. *Cladosporium baptisiae* was described from a collection made on living leaves of *Baptisia leucophaea* Nutt. in Wisconsin (Greene, 1948) and has not, to our knowledge, been subsequently studied. *Cladosporium carpophilum* [the anamorph of *Venturia carpophila* Fisher] was recorded on leaves of *Acacia koa* var. *hawaiiensis* in Hawaii (Raabe *et al.*, 1981). This fungus normally occurs on members of the genus *Prunus* L. [Rosaceae], including almond [*P. dulcis* (Mill.) D. Webb], apricot [*P. armeniaca* L.], peach [*P. persica* (L.) Batsch.] and plum [*Prunus* spp.] (see Ellis, 1971), causing a disease known as 'freckle' or 'scab'. The record on koa is, therefore, questionable and needs confirming. *Cladosporium infuscans* Thum., which was described from living stems of *Desmodium strictum* DC., collected at Aiken, South Carolina, is now classified as *Dendryphiella infuscans* (Thum.) M.B. Ellis.

Cladosporium myriosporum Ell. & Dearn., *C. pisi*, Cugini & Macch. and *C. pisicolum* were all described from *Pisum sativum* (Ellis and Dearness, 1897; Cugini and Macchiati, 1891; Snyder, 1934; respectively). The status of these binomials is currently uncertain. *Cladosporium myriosporum*, described from pea pods in Canada (Ellis and Dearness, loc. cit.), and said to have minutely echinulate conidia, could possibly be *C. herbarum*. There are additional records of it on *P. sativum* from New York and Wyoming (Anon., 1960). *Cladosporium pisi* was originally determined to cause a pea disease in Italy (Cugini and Macchiati, 1891), but subsequently some doubt was cast on its pathogenicity by Curzi and Barbaini (1927). The latter authors concluded pod intumescence or swelling to be caused by climatic factors such as temperature, humidity and light and that colonization by the fungus was secondary. They further expressed the view that *C. pisi* was *C. herbarum*. Shaw (1973) continued to use the binomial *C. pisi* in a host fungus index for the Pacific Northwest. When describing *C. piscicolum* as the causal organism of a leaf, stem and pod spot of pea in California, Snyder (1934) expressed agreement with Curzi and Barbaini (loc. cit.) and was of the opinion that the disease under study by him was different from the condition described in Italy. Heald (1930) had previously encountered a black spot on pea seeds caused by a *Cladosporium* sp. in the state of Washington. De Vries (1952), following examination of two strains deposited at the Centralbureau voor Schimmelcultures, Baarn, in 1935 by W.C. Snyder, determined *C. piscicolum* to be morphologically indistinguishable from *C. cladosporioides*. Because of this, and recognizing the pathogenicity of the entity to pea, de Vries (loc. cit.) accommodated *C. piscicolum* within *C. cladosporioides* as a *forma specialis* [as *C. cladosporioides* f. sp. *pisicola* (Snyder) de Vries]. It has been recorded as causing necrotic spotting of aerial parts of *Pisum sativum* in Maine, Oregon, Texas, Utah and Washington, in addition to California (Anon., 1960; Shaw, 1973) and is listed under the name *C. cladosporioides* f. sp. *pisicola* by Farr *et al.* (1989). Whether or not it is satisfactorily classified as such needs reevaluation.

Cladosporium vignae was described as the causal organism of pod spot of cowpea [*Vigna unguiculata* (L.) Walp. (as *Vigna sinensis* Endl.)] by Gardner (1925). He had encountered it inducing spotting of pods of the 'Early Buff' variety in August of 1923 and 1924 at Lafayette, Indiana. He also reported it to be pathogenic to asparagus bean [*Vigna unguiculata* subsp. *sesquipedalis* (L.) Verde (as *V. sesquipedalis* Wight.)], whereas *V. catjang* Walp. was said to be highly resistant. This fungus has subsequently been reported as the cause of scab, leaf and pod blight of cowpea (black-eyed pea) in a number of states, including Alabama, Georgia and Mississippi (Blain, 1931; Toler *et al.*, 1963; Parris, 1959). There is also a record of its occurrence causing a spot on *Pisum sativum* in North Carolina (Winstead *et al.*, 1960), although the fungus implicated in that instance is more likely to have been *C. cladosporioides* f. sp. *piscicola*, but misdetermined. De Vries (1952) reported examining an isolate of *C. vignae* sent to the Centraalbureau voor Schimmelcultures by M. W. Gardner in 1925, but found sporulation to be poor. On the basis of what could be observed, he concluded that this species had similarity with *C. cladosporioides* and that it would probably have to be considered as a *forma specialis* of that species once better isolates were studied.

In addition to the *Cladosporium* species noted above to occur on Fabaceae, another species has been described in England. *Cladosporium album* Dowson was reported as causing a disease of sweet pea [*Lathyrus odoratus* L.], with a mildew-like appearance, (Dowson, 1924). It was said to be identical to *C. herbarum*, except for lack of any pigmentation. The fungus was isolated in pure culture and, in infection experiments under glass, the disease was reproduced on sweet peas, but no infection could be obtained on *Pisum sativum* nor on *Lathyrus aphaca* L.

During August, 1989, a severe leaf blight of shrub bushclover (*Lespedeza bicolor* Turcz.) in western Lee Co., Alabama was brought to our attention. Disease symptoms were irregularly spreading, somewhat ill-defined, pale brown to brown necrotic blotches. *Lespedeza bicolor* cultivar 'Thunbergii' was found to be severly diseased, whereas cultivar 'Am Quail' was little affected. A species of *Cladosporium* was repeatedly isolated from such blotches and inoculation experiments conducted with cultivar 'Thunbergii' to fulfill Koch's postulates (J.M. McKemy and R.T. Gudauskas, unpublished data) showed this fungus to be the causal organism of the disease. Although the disease could be reproduced, symptoms were, however, less severe and more in the form of leaf spots. There do not appear to have been any previous records of a *Cladosporium* occurring on *Lespedeza* spp. and, in an attempt to determine the specific identity of that encountered on *L. bicolor*, the various species mentioned above were considered. Studies of the fungus in nature on the host and *in vitro* reveal that it is neither *C. cladosporioides* nor *C. herbarum*. A comparison with the type material of *C. vignae* , on pods of *Vigna unguiculata*, has convinced us that it is that species. Beyond the investigation by de Vries (1952), no further study of this has, to our knowledge, been undertaken. No mention of the species is made by Ellis (1971; 1976). Although the conidiophores produced *in vivo* on leaves of *L. bicolor* are not totally identical with those on pods of *V. unguiculata*, some being longer and more macronematous, the fungi are essentially very similar. Conidiophores tend to be variable and a range of forms from semi-macronematous to macronematous is produced. Ideally, comparison of isolates from both hosts should be made *in vitro*, as should further study of *C. piscicolum* in culture. At the present time, we are in a position to describe *C. vignae* as we currently understand it, with

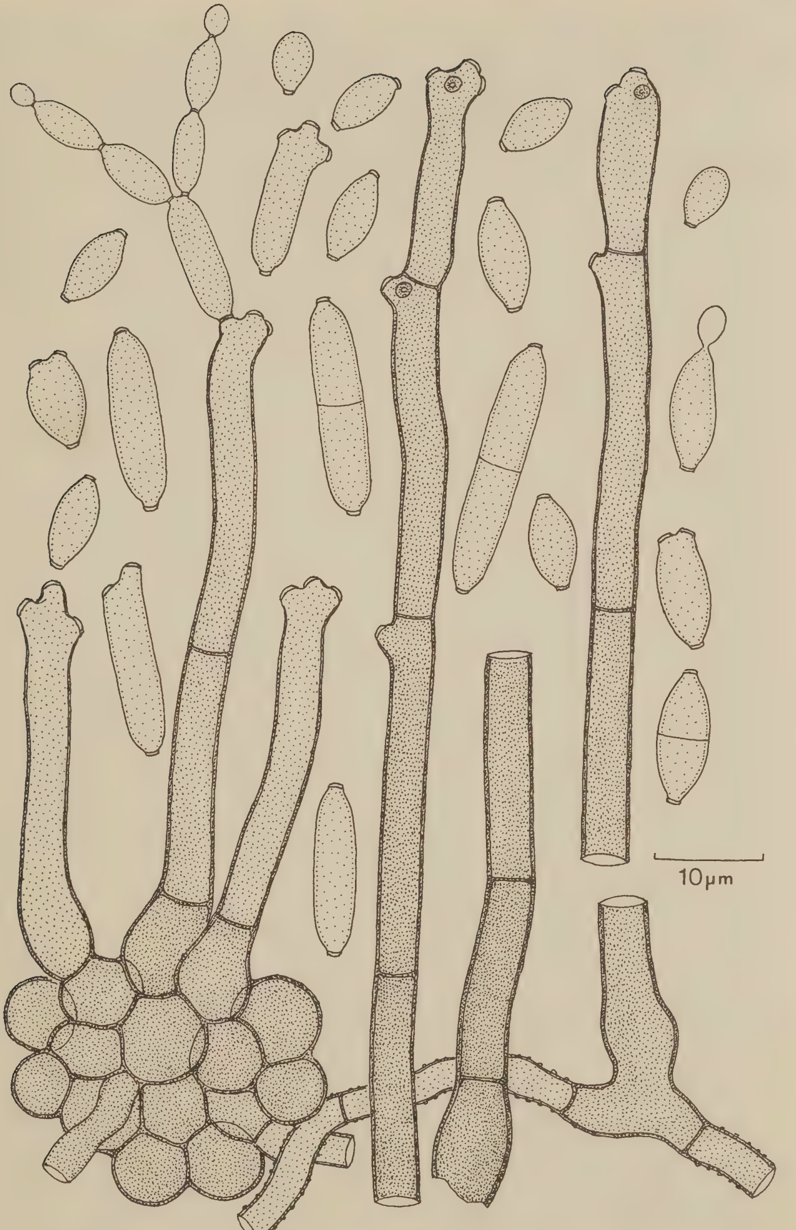


FIGURE 1. *Cladosporium vignae.* Stromata-like cell aggregations, conidiophores and conidia (from type on pods of *V. unguiculata*).

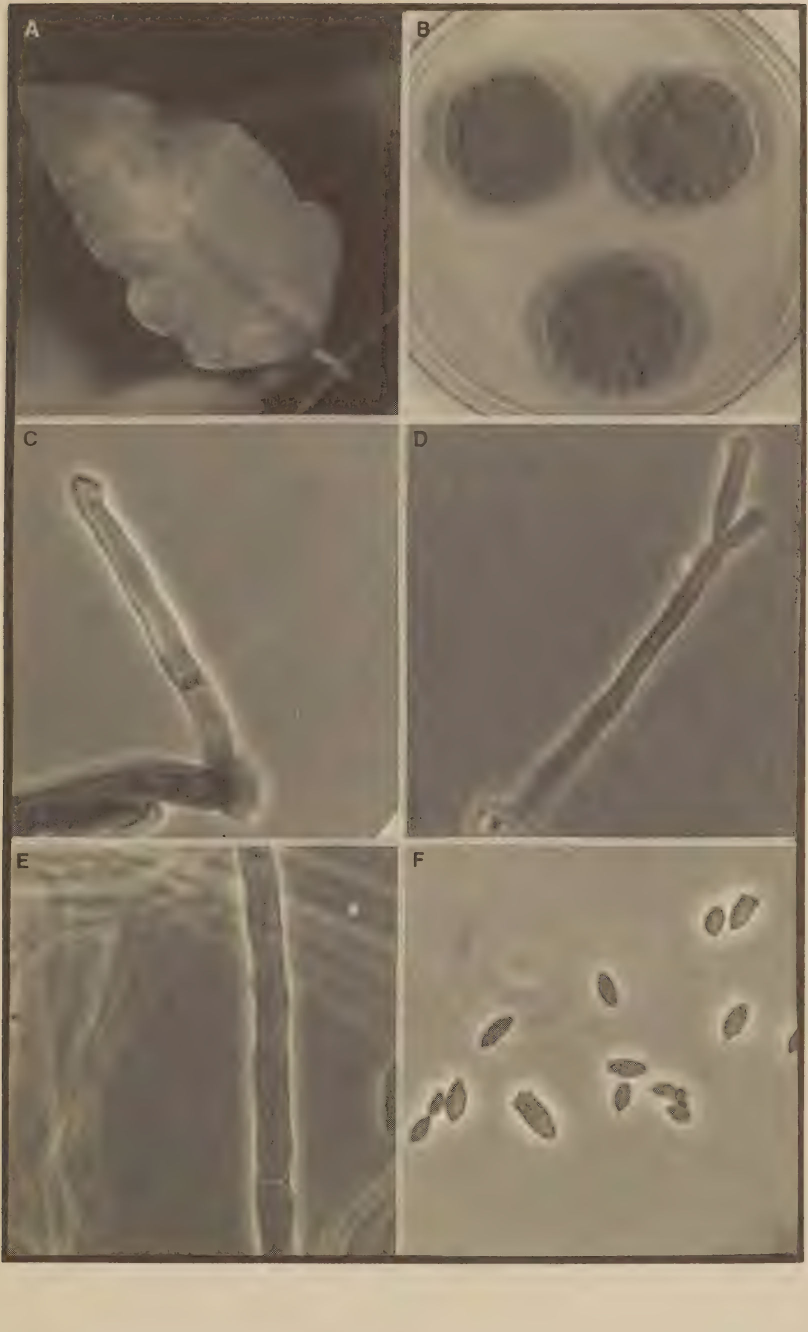
the caveat that additional studies will be required to confirm its host range and the characteristics that distinguish it from closely related taxa.

TAXONOMIC PART

Cladosporium vignae Gardner, *Phytopathology* 15: 457, 1925 (Plate 1, Figures 1 & 2).

Leaf blotches [Plate 1, A] irregular, at first pale brown, becoming mid chocolate brown with age. Pod spots as dark, purple brown, scabby lesions, irregular, up to 6 mm in diameter. Colonies in nature effuse, greyish brown, confined to necrotic areas on leaves and pods. Mycelium mostly immersed, composed of branched, septate, sub-hyaline to pale brown, smooth or minutely verruculose, 2-3 µm wide hyphae. Stromata-like masses of isodiametric, more or less subglobose, thick-walled, pale to mid brown, 7-9 µm in diameter cells, frequently formed on pods. Colonies on potato dextrose agar (PDA) [Difco] grown at 25C attaining a diameter of 19 to 22 mm and 28 to 30 mm after 7 and 14 days, respectively, velvety or slightly lanose toward the center; at 20C attaining a diameter of 13 to 14 mm and 20 to 21 mm after 7 and 14 days; at 30C attaining a diameter of 8 to 9 mm and 14 to 15 mm after 7 and 14 days. At 7 days, Dull Green to Greenish Grey [30E2/30E3 to 29E3 (Kornerup and Wanscher, 1978)] in color, with a peripheral Dull Green to Greyish Green [30E4/30E5] zone and a 1 mm wide, white, even margin, sulcate, with three to five deep radial furrows extending more or less from the center to the extreme periphery; reverse Grey [3E1] at the center, Greyish Brown (Drab Mouse Grey) [5E3] toward the edge, with the agar split at the radial furrows. After 14 days [Plate 1, B], Grey [29D1] in the center, Greenish Grey [29E1/29E2] to Dull Green [28E3/28E4] or Greyish Green [30E5] in color elsewhere, color changing with increased conidiation, with a very narrow, whitish, slightly scalloped margin, moderately deep, dense, surface texture velutinous, with colorless exudate droplets sometimes present, radially sulcate, with, in addition to primary furrows, three or four secondary, short, somewhat bent or contorted furrows, extending inward and sideways from the periphery; reverse Brownish Grey [6E2] at the center, blackish elsewhere, often Greyish Brown [11E3] to Greyish Ruby [12E3] toward the margin. In older cultures, colonies becoming Olive [3E3] to Olive Brown [4E3/5E3] to Greyish Brown [5F3] in color. Hyphae in culture frequently verruculose. Conidiophores variable, semi-macronematous or macronematous, arising singly, terminally or laterally from hyphae, or in caespitose clusters of a few from a group of isodiameteric cells, cylindrical, unbranched, thick-walled, pale to mid brown to brown, smooth or sometimes verruculose toward the base, sympodial, erect, more or less straight, or slightly flexuous, more so in culture, bearing a number of ramo-conidia apically or subapically, fertile

PLATE 1. *Cladosporium vignae.* A, typical lesion on leaf of *Lespedeza bicolor*; B, 14-day-old colonies on PDA; C, conidiophore from nature; D, portion of conidiophore from culture; E, verruculose base of conidiophore from culture; F, conidia.


A
B
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conidiogenous area restricted, up to 280 µm long, 4-5 µm wide, often somewhat bulbous at the base. Conidiogenous cells holoblastic, polyblastic, integrated, terminal or intercalary, where intercalary conidial scars usually immediately subtending and in close proximity to a transverse septum, sympodial growth limited, bearing a number of conidial scars. Conidia catenate, in long, branched chains. Ramo-conidia cylindrical to clavate, smooth, 0 to 2-septate, pale brown, usually with two or three terminal conidial scars, often associated with small protuberances, 10-32 X 2.5-4 µm. Intercalary conidia ellipsoidal to narrowly limoniform, smooth, 0 to 1-septate, with a single scar at each end, 6-9 X 2-3.5 µm. Terminal conidia ellipsoidal, subhyaline to very pale brown, 4-5 X 2-3 µm.

On *Lespedeza bicolor* and *Vigna unguiculata*; North America.

Collections examined: on *V. unguiculata* [as *V. sinensis*], Lafayette, Indiana, September 1924, M.W. Gardner, BPI 427602, type; on *L. bicolor*, Lee Co., Alabama, August 1989, D.L. Turner, AUA [isolate derived from this collection is being deposited at ATCC].

DISCUSSION

Cladosporium vignae belongs to a group of presumably closely related species that have sympodial conidiophores with closely localized conidiogenous loci and ramo-conidia of similar size and morphology. These include *C. cladosporioides*, *C. cucumerinum* Ell. & Arth., *C. tenuissimum* Cooke, and *C. sphaerospermum* Penz. These taxa are distinguished by the detailed morphology of their conidiophores and conidia and, in the case of *C. cucumerinum*, host specificity and pathogenic capacity. *Cladosporium tenuissimum*, a plurivorous species on a wide range of host substrates, which is common in the tropics, is also morphologically similar but is characterized by having very long, more or less straight, mid to dark brown conidiophores bearing up to five ramo-conidia in close proximity to one another at and a short distance below the extreme apex. There is little extended sympodial growth proliferation associated directly with serial conidiation in the manner typical of *C. herbarum* (Pers.) Link (see McKemy and Morgan-Jones, 1991b). *Cladosporium oxysporum* Berk. & Curt., another plurivorous species with long conidiophores and localized conidiogenesis, which also has similar conidia, is distinguished by having swollen nodes along the length of the fertile portion (see Ellis, 1971; McKemy and Morgan-Jones, 1991a). Following conidiogenesis at one level, conidiophores in *C. tenuissimum* may continue growth and extend appreciably in length before renewing conidiation at a higher level. During this process septation occurs, resulting in the site of original conidiogenesis becoming intercalary. A similar pattern of growth and septation often occurs in *C. vignae*. As indicated in the above description, one or more conidial scars usually occur just below the level of a septum in the upper portion of the conidiophore. One or two such intercalary conidiogenous cells are not uncommon in the conidiophores of *C. vignae*.

The binomial *Cladosporium vignae* is being used herein for the fungus encountered on *Lespedeza bicolor* with some confidence although, as alluded to above, further critical studies *in vitro* are required before the fungi of the *C. cladosporioides/piscicolum/vignae* complex are fully understood and

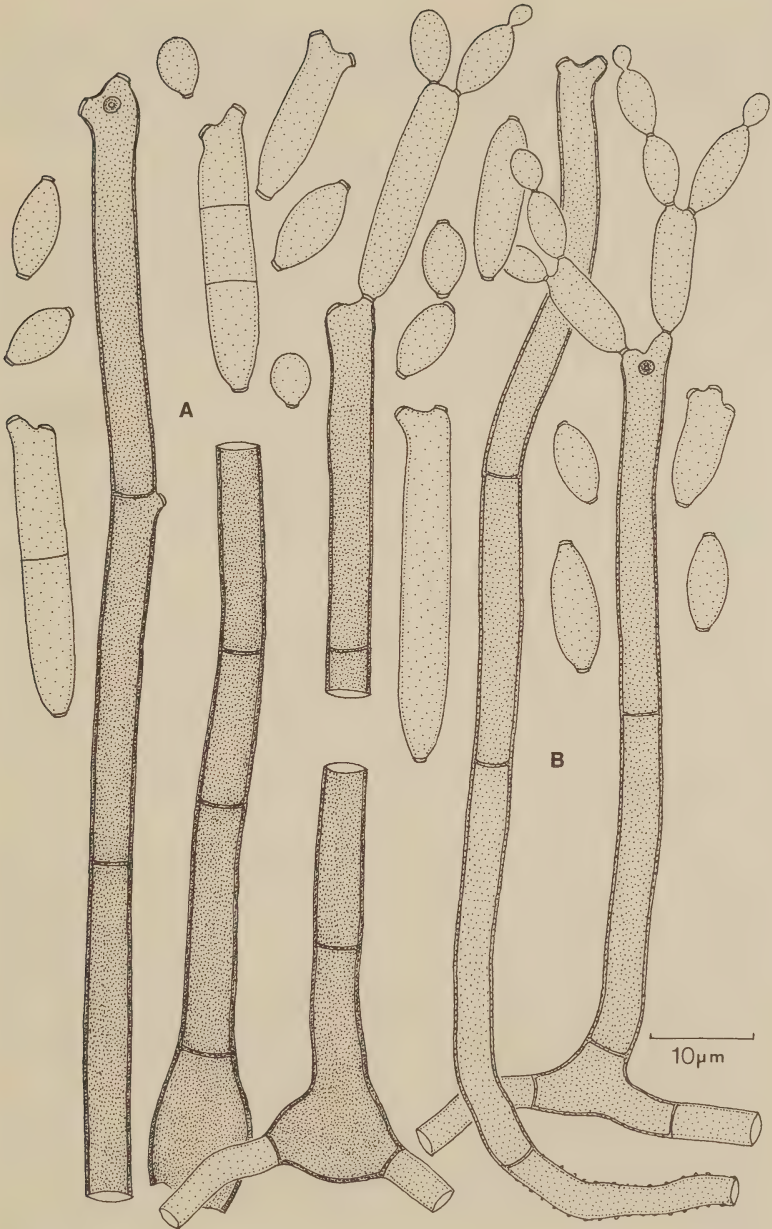

FIGURE 2. *Cladosporium vignae*. A, Conidiophores and conidia from leaves of *Lespedeza bicolor*; B, same from culture on PDA.

adequately characterized. Although Gardner (loc. cit.) did not provide a Latin diagnosis for *Cladosporium vignae*, the name was published before 1935 and is therefore legitimate (Greuter, 1988). It is uncertain what variation in cultural characteristics, including colony growth rates, appearance and coloration, exists among these fungi. The purple [Greyish Ruby (12E3/12E4)] pigmentation at the edge of colonies in reverse, along with other characteristics such as verruculose vegetative hyphae, may be useful in recognizing *C. vignae*. This coloration is often quite pronounced and distinctive. The pigmentation appears to be located within submerged hyphae. De Vries (1952) noted the presence of purple and violet pigments, both extra- and intracellular and in aerial as well as immersed hyphae, in a number of *Cladosporium* species. The narrow white margin of young colonies of *C. vignae* on PDA is also a distinguishing feature. In our experience, saprotrophic species, such as *C. herbarum* and *C. oxysporum* (see McKemy and Morgan-Jones, 1991a; 1991b;), grow appreciably faster at 25C on PDA than do pathogens such as *C. vignae*. We have found *C. cucumerinum*, which will be treated in the next paper in this series, to be easily distinguishable in its cultural and other features from *C. vignae* as recognized here. An answer to the question of whether or not *C. piscicolum* and *C. vignae* are sufficiently different from *C. cladosporioides*, apart from their pathogenicity, to warrant separate recognition must await further studies. Preliminary indications lead us to believe that, at least in the case of *C. vignae*, sufficient differences exist to maintain the binomial. It may well be that *C. cucumerinum*, *C. piscicolum* and *C. vignae*, all pathogens, although morphologically similar to *C. cladosporioides*, are distinct entities. The latter is commonly considered to be a saprophyte occurring on textiles and in soil as well as being a secondary invader of diseased plant tissues. *Cladosporium piscicolum* and *C. vignae* are presumed to be distinct entities because, apart from small described differences in morphology and conidium size, cross-inoculation experiments to their respective hosts have been negative. Gardner (1925) reported *Pisum sativum* seedlings to be resistant to *C. vignae* and Snyder (1934) found that *Vigna unguiculata* (as *V. sinensis*) and *Lathyrus odoratus* were not infected by *C. piscicolum*. In order to fully understand the various entities within this complex, critical comparison of isolates from English pea, cowpea, and other hosts, *in vitro*, are needed.

In terms of colony coloration on PDA, the isolate of *C. vignae* from *Lespedeza bicolor* matches the description of Gardner (1925) reasonably well, though not perfectly. Using Ridgway's Color Standards and Color Nomenclature (Ridgway, 1912), Gardner (loc. cit.) reported colonies to be at first Vetiver Green. This matches Dull Green [30E4/30E5] in Kornerup and Wanscher (1978). In Ridgway, this is next to Tea Green, a color which more or less matches Greenish Grey [29E3]. The color of older colonies, Grayish Olive to Deep Grayish Olive of Ridgway (there is no Deep Grayish Green as noted by Gardner), approximates Olive to Olive Brown [3E3/4E3] and Grey [29E1]. The intermediate color of Lincoln Green noted by Gardner is, however, at variance with the color changes that our isolate from *L. bicolor* undergoes.

Some of the records in the literature, reviewed above, of various species of *Cladosporium* occurring on members of the Fabaceae, are, as previously mentioned, suspect because of possible misdeterminations. In addition to those already noted, it should be borne in mind that records of *C. herbarum* as the implicated organism in disease such as pod and seed spot of *Phaseolus* spp., and

Pisum sativum, and as the cause of leaf spot of *Robinia pseudoacacia*, should be treated with at least some scepticism. Likewise, some of the records of *C. cladosporioides* could well have involved either *C. piscicolum*, in the case of *P. sativum*, and *C. vignae*, in some of the other instances, including those on lima and French beans.

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LITERATURE CITED

ANON. 1960. Index of Plant Diseases in the United States. U.S.D.A. Handbook. No. 165. Washington, D.C. 531 pp.

ALFIERI, S. A., JR., K. DR. LANGDON, C. WEHLBURG, and J. W. KIMBROUGH. 1984. Index of Plant Diseases in Florida. *Fl. Dept. Agric. and Consumer Services, Div. of Pl. Ind. Bull.* 11 (revised), 389 pp.

BAKER, G. E., P. H. DUNN, and W. S. SAKAI. 1979. Fungus communities associated with leaf surfaces of endemic vascular plants in Hawaii. *Mycologia* 71: 272-292.

BLAIN, W.L. 1931. A list of diseases of economic plants in Alabama. *Mycologia* 23: 300-304.

CASH, E. K. 1953. A checklist of Alaskan fungi. *Pl. Dis. Reptr. Suppl.* 219: 1-70.

CUGINI, G. and L. MACCHIATI. 1891. Notizie intorno agli insetti, acarie parassiti vegetali osservati nelle piante coltivate e spontane del modenese nell'anno 1890. *Boll. R. Staz. Agr. Modena*, n.s., 10 (1890): 89-107.

CURZI, M. and M. BARBAINI. 1927. Intumescenze e *Cladosporium pisi* sui legumi di *Pisum sativum. Atti Ist. Bot. R. Univ., Pavia* III, 3: 91-105.

DE VRIES, G.A. 1952. Contribution to the knowledge of the genus *Cladosporium* Link ex Fr. Diss. Univ. Utrecht, 121 pp.

DIENER, U. L. 1960. The mycoflora of peanuts in storage. *Phytopathology* 50: 220-223.

DOWSON, W. J. 1924. Contributions from the Wisley laboratory. XLIV. A new disease of sweet peas. *J. R. Hortic. Soc.* 49: 211-221.

ELLIS, J.B. and J. DEARNESS. 1897. New species of Canadian fungi. *Proc. Can. Inst.*, n.s., 1: 89-93.

ELLIS, M.B. 1971. Dematiaceous Hyphomycetes. Commonw. Mycol. Inst., 608 pp.

ELLIS, M.B. 1976. More Dematiaceous Hyphomycetes. Commonw. Mycol. Inst., 507 pp.

FARR, D.F., G.F. BILLS, G.P. CHAMURIS and A.Y. ROSSMAN. 1989. Fungi on plants and plant products in the United States. 1st Ed. APS Press, 1252 pp.

GARDNER, M.W. 1925. *Cladosporium* spot of cowpea. *Phytopathology* 15: 453-462.

GREENE, H.C. 1948. Notes on Wisconsin parasitic fungi. X. *Am. Midl. Naturalist* 39: 444-456.

GREENE, H.C. 1956. Notes on Wisconsin parasitic fungi. XXII. *Trans. Wisc. Acad. Sci.* 45: 171-191.

GREUTER, W. (Ed.). 1988. International Code of Botanical Nomenclature. *Regnum Veget.* 118: 1-328.

HEALD, F.D. 1930. Division of plant pathology. *Wash. Agr. Exp. Sta. Ann. Rept.* 40 (Bull. 245):47-50.

JORDAN, E. G., J. B. MANANDHAR, P. N. THAPLIYAL and J. B. SINCLAIR. 1986. Factors affecting soybean seed quality in Illinois. *Pl. Dis.* 70: 246-248.

KILPATRICK, R. A. and H. W. JOHNSON. 1953. Fungi isolated from soybean parts at Stoneville, Mississippi, in 1951-52. *Pl. Dis. Reptr.* 37: 98-100.

KORNERUP, A. and J.H. WANSCHER. 1978. Methuen Handbook of Colour. 3rd Ed. Hastings House, New York, 252pp.

MCKEMY, J.M. and G. MORGAN-JONES. 1991a. Studies in the genus *Cladosporium sensu lato*. IV. Concerning *Cladosporium oxysporum*, a plurivorous, predominantly saprophytic species in warm climates. *Mycotaxon 41: 397-405.*

MCKEMY, J.M. and G. MORGAN-JONES. 1991b. Studies in the genus *Cladosporium sensu lato*. V. Concerning the type species, *Cladosporium herbarum. Mycotaxon* 42 (in press).

MILLER, W. A. and K. W. ROY. 1982. Mycoflora of soybean leaves, pods, and seeds in Mississippi. *Can. J. Bot.* 60: 2716-2723.

PARRIS, G.K. 1959. A revised host list of Mississippi plant diseases. *Miss. St. Univ., Bot. Dept. Misc. Bull* 1:1-146.

PRASIL, K. and DE HOOG, G.S. 1988. Variability in *Cladosporium herbarum. Trans. Br. mycol. Soc.* 90:49-54.

RAABE, R. D., I. L. CONNERS, and A. P. MARTINEZ. 1981. Checklist of Plant Diseases in Hawaii. *Hawaii Inst. Trop. Agr.* and *Human Resources Inf. Text. Ser.* no. 22. 313 pp.

RIDGWAY, R. 1912. Color standards and color nomenclature. Washington D.C. 43 pp.

SHAW, C. G. 1973. Host fungus index for the Pacific northwest - I. Hosts. *Wash. St. Agric. Exp. Sta. Bull.* 765: 1-121.

SNYDER, W.C. 1934. A leaf stem and pod spot of pea caused by a species of *Cladosporium. Phytopathology* 24: 890-905.

STIPES, R. J. and T. C. DAVIS. 1972. Diseases of landscape trees observed in Virginia. *Pl. Dis. Reptr.* 56: 108-111.

TOLER R.W., S.S. THOMPSON and J.M. BARBER. 1963. Cowpea (southern pea) diseases in Georgia, 1961-1962. *Pl. Dis. Reptr.* 47: 746-747.

WILSON, V. E. and J. BRANDSBERG. 1965. Fungi isolated from diseased lentil seedlings in 1963-1964. *Pl. Dis. Reptr.* 49: 660-662.

WINSTEAD, N.N. D.L. STRIDER and L.H. PERSON. 1960. Vegetable diseases in North Carolina during 1958-1959. *Pl. Dis. Reptr.* 44: 491-495.

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TWO NEW HYPHOMYCETES FROM INDIA

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ABSTRACT

Two new Hyphomycetes from India, Beltraniella patilii and Xenosporium pirozynskii, are described and illustrated.

Keywords: Hyphomycetes, India, Beltraniella patilii, Xenosporium pirozynskii.

INTRODUCTION

In the course of survey for fungi under the project, 'Mycoflora of Maharashtra and Goa', India, the senior author collected two interesting Hyphomycetes described here as new.

Beltraniella patilii sp. nov. Fig. 1 & 2

Coloniae epiphyllae, velutinae, fusco-atrae; mycelium partim superficiale, partim immersum; conidiophorae setiformes, macronematosae, mononematosae, e cellula basali lobata, rectae vel flexuosae, pallido-brunneae, laeves, septatae, usque ad 240 µm altae ad basi 3.5-5 µm latae attenuatae 1.5-2 µm ad apicem; cellulae conidiogenae discretae, solitarae vel 2 - 5 verticillis dispositae, polyblasticae, denticulatae, subhylinae vel pallido-fuscae, ovoideae ad ampulliformae, tenuitunicatae, continuae, 6-8.5 X 4.5-6 µm; saepe setae non - ramosae, sterilis, pallido-fuscae, laeves, 1-3 septatae, curvae, acutae, 17-41.5 X 1.5-3 µm supra 1-2 cellulae conidiogenae; conidia solitaria, pallide-fusca, late turbinata, basi rostrata ad apicem abrupte truncata, laevea, 1-3 poris subhyalinis; conidia magnit. 24-34 X 7-8.5 µm.

In follis dejectis putridis Terminalia sp., Anmode Ghat, Goa, India, Leg. K.G. KARANDIKAR, 4. XI. 1982. AMH 6063 (Holotypus).

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Beltraniella patilii sp. nov. Fig. 1 & 2

(named after Late Prof. S.D. Patil, Pune)

Colonies epiphyllous, velvety, brownish black; mycelium partly superficial partly immersed; conidiophores setiform, macronematous, mononematous with lobed basal cell, straight or flexous, pale brown, darker at base, smooth, septate, up to 240 µm high, 3.5-5 µm wide at base, tapering 1.5-2 µm near apex; conidiogenous cells discrete, solitary or mostly arranged in verticel of 2-5, polyblastic, denticulate, subhyaline to pale brown, ovoid to ampulliform, thin walled, non-septate, 6- 8.5 X 4.5 - 6 µm, giving rise to conidia directly. Often 1 - 2 conidiogenous cells producing unbranched, pale brown, smooth, 1-3 septate, curved, pointed, sterile setose lateral branches; setose branches 17-41.5 X 1.5-3 µm; conidia solitary, pale brown, turbinate with rostrate proximal end and abruptly truncate distal end, smooth, with 1-3 subhyaline, circular pores near broadest part, conidia 24-34 X 7-8.5 µm.

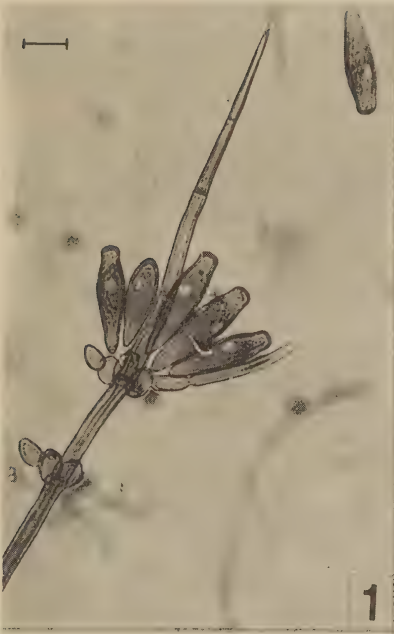
On fallen, decaying leaves of Terminalia sp.; Anmode Ghat, Goa, India, Leg. K.G. KARANDIKAR, 4-11-1982, AMH 6063 (Holotype).

Beltraniella patilii is similar to B. porosa Pirozynski & Patil (1970) which, however, has conidia with 4-5 pores and branched chains of conidiogenous cells. Beltraniella pirozynskii Kirk (1981) agrees with B. patilii in having conidiogenous cells in verticel, but the conidia do not possess pores. B. patilii differs from both B. porosa and B. Pirozynskii in having larger conidia and sterile, unbranched, lateral setose branches on the main axis of the setiform conidiophore.

Xenosporium pirozynskii sp. nov. Fig. 3 & 4

Coloniae effusae, atro-brunneae; mycelium superficiale; hyphae 5-7 µm latae; conidiophorae macronematosae, mononematosae vel 2-3 aggregatae, non-ramosae, pallido-fuscae vel atro-brunneae, laeves, septatae usque ad 190 µm altae, 5-10.5 µm latae; cellulae conidioginae integratae, monoblasticae, terminalae; conidia solitaria, brunnea, laevea, helicoidea septatae, diametro superarum 31-48.5 µm, filamentosum conidiorum 17.5-29 µm lata, cellulae basalis 12-15.5 µm latae; conidia secundarea 1-4, atro-brunnea, sphaerica, continua, diametro superarum 7-10.5 µm.

Figs. : 1 & 2 - Beltraniella patilii,
1 - setiform conidiophore showing conidiogenous cells, conidia and sterile setose lateral branch;
2 - conidiogenous cells and conidia.
3 & 4 - Xenosporium pirozynskii,
3 - conidiophores and conidia; 4 - a conidium with secondary conidium . **Scale = 10 um .**



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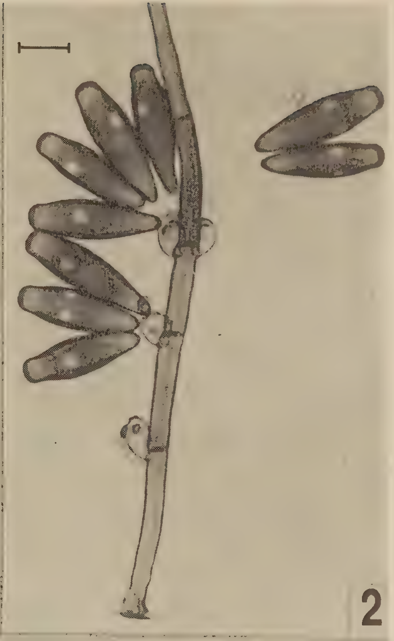

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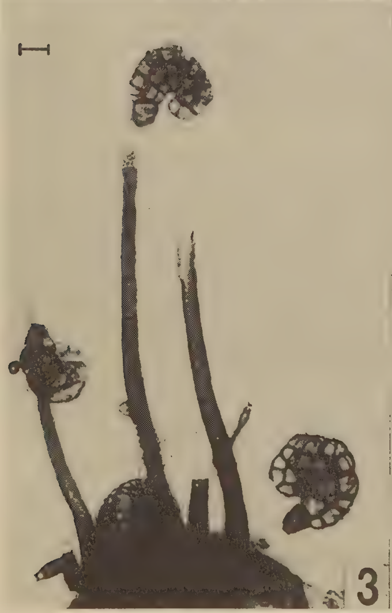

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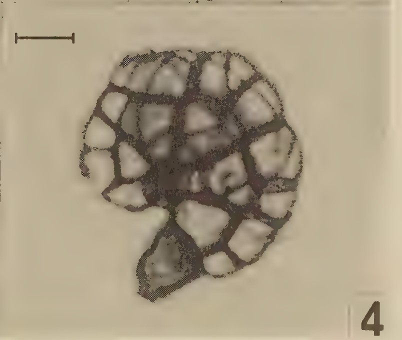

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In caulis emorti Cassia tora L., Allapalli (Vidarbha), India,Leg.K.G.KARANDIKAR, 24.XII.1983, AMH 5541 (Holotypus).

Xenosporium pirozynskii sp. nov. Fig. 3 & 4
(named after Dr. K.A. Pirozynski, Canada)

Colonies effuse, blackish brown; mycelium superficial made up of branched, smooth, septate, 5-7 µm wide hyphal threads; conidiophores macronematous, mononematous rarely in group of 2-3, slightly flexous, unbranched, dark brown, paler towards apex, smooth, septate, up to 190 µm high, 7-10.5 µm wide at base, tapering to 5 - 6.5 µm towards apex; conidiogeneous cells integrated, monoblastic, terminal; conidia solitary, brown, helicoid, 3/4th to 1 time coiled, conidial filament made up of two rows of cells; conidia 31- 48.5 µm in diameter; conidial filament 17.5-29 µm wide with 12-15.5 µm broad darker basal cell; secondary conidia 1-4, dark brown, spherical, non-septate, 7-10.5 µm in diameter, borne from innermost part of conidial filament.

On dead twings of Cassia tora L., Allapalli (Vidarbha), India, Leg. K.G. KARANDIKAR, 24-12-1983, AMH 5541 (Holotype).

Recently Goos (1990) has provided description of known species of Xenosporium Penzig & Saccardo. The new species is morphologically similar to X. berkeleyi (Curtis) Pirozynski, X. larvale (Morgan) Pirozynski and X. pleurococcum (Höhnel) pirozynski, and in mode of septation of the conidial filament, which has two rows of cells.

The new species differs from X. berkeleyi and X. larvale in having bigger conidia and secondary conidia. Likewise X. pleurococcum differs from new species in having inverted 'U' shaped conidia with hyaline papilla on the apical cell. The new taxon is also distinct in having strictly unbranched and larger conidiophores than related species.

ACKNOWLEDGEMENTS

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REFERENCES

1. GOOS, R.D. 1990. Review of the anamorph genus Xenosporium. Mycologia 82: 742-752.
2. KIRK, P.M. 1981. New or interesting microfungi-III. Trans. Br. Mycol. Soc. 77: 457-473.
3. PIROZYNSKI, K.A. & S.D. PATIL, 1970. Some setose Hyphomycetes of leaf litter in South India. Can. J. Bot. 48: 567-581.

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AMANITA CHEPANGIANA—A NEW SPECIES FROM NEPAL

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Summary

Amanita chepangiana is described as new from central Nepal. Its use as food by indigenous peoples is related.

Amanita chepangiana Tulloss & Bhandary sp. nov. Holotypus: **NEPAL**, Chitwan District, Jugedi, 12.vii.1990 Hemanta Ram Bhandary Hb (NHMTU[1])

Etymology: Named after the Tibeto-Burman speaking tribes called Chepang who inhabit the remote areas of Chitwan and Dhading Districts in central Nepal. *Amanita chepangiana* is a prized edible fungus among the Chepang peoples who have a long acquaintance with it.

Pileus lacteus, disco aliquando subgriseo vel subflavo, 130 - 190 *mm diametro; margine striata; materia volvica floccosa, alba, evanescente. Lamellae confertae, liberae, albae vel subroseae. Stipes* 150± - 180 × 21± *mm, albus, floccosus vel fibrilloso-squamulosus, annulatus. Volva circumsciscens, membranacea, coriacea, praecrassa, alba vel albida,* 50 - 60 *mm alta,* 35 - 50 *mm lata. Caro alba. Basidia tetrasterigmatica,* 31 - 53 × 10.8 - 15.5 *µm. Fibulae praesentes. Sporae* (6.5-) 9.2 - 12.5 (-14.8) × (5.8-) 8.0 - 10.5 (-12.0) *µm, subglobulosae vel late ellipsoideae, amyloideae. In sectione Amidellis forma subhymenii et amplitudine et forma sporarum*

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[1] The herbarium name abbreviations used in this paper are

L - Rijksherbarium, Leiden, The Netherlands
NHMTU - Herbarium, Natural History Museum, Tribhuvan University, Kathmandu, Nepal
NY - Herbarium, The New York Botanical Garden, Bronx, U.S.A.
RET - private herbarium of R. E. Tulloss
TNS - Herbarium, National Science Museum, Tokyo, Japan

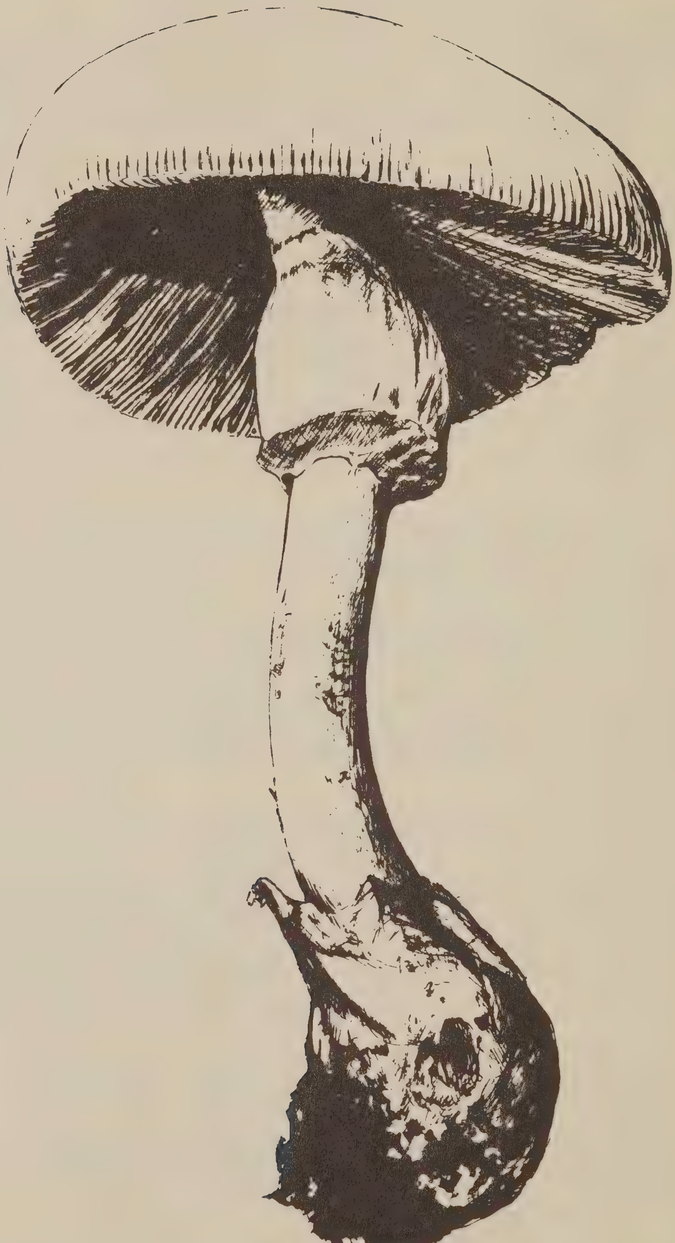

Fig. 1 *Amanita chepangiana* (holotype). Habit (×1).

distinguenda.

Amanita chepangiana (Fig. 1) is a medium-sized, white or whitish mushroom the pileus of which is floccose at first. The pileus has a striate margin which is probably initially appendiculate. The free lamellae have a slight pink tint. The stipe bears an ephemeral, large, skirt-like, membranous, partial veil and has at its base a rather large, tubular, whitish, thick, membranous, universal veil. The hymenium arises from a mat of interwoven hyphae that is parallel to the hymenial surface. Clamps were observed to be rather common at the bases of basidia and in the interior layer of the layered, universal veil.

PILEUS: 130 - 190 mm diam, milk white, at times slightly grayish to slightly yellowish (3A2 to 4A3)[2] on disk, hemispherical (at first) to convex to expanded convex to planar or with disk somewhat depressed in age, somewhat shiny under universal veil, becoming viscid when wet; pileipellis peeling from margin to center; margin decurved, becoming distinctly striate (0.1R - 0.15R) even in rather early stages of expansion, at times somewhat tuberculate striate, probably appendiculate in early stages of expansion; context pure or milk white, thick, not discoloring or bruising, thinning evenly from disk to margin; universal veil remnants as dense white flocculence which disappears at maturity or is washed off by rains. LAMELLAE: free, crowded, thin and brittle, white with very slight pink tinge, drying 2.5Y 8/4 to 10YR 7/8 to about 10YR 8/3, up to 15 mm broad, with white edge minutely flocculent, some forking; lamellulae rather plentiful and of varying length, subattenuate to attenuate. STIPE: 150^{-} - 180 × 21± mm, narrowing slightly upward, flaring slightly at apex, covered with white flocculence or fibrillose to squamulose below annulus and pulverulent above it, turning pale yellowish or grayish when handled; context white becoming pale yellowish on bruising, stuffed with white cottony material to hollow, central cavity 6 - 17 mm diam, lacking a basal bulb; partial veil pendant, membranous, thin, ephemeral, white, apical to superior, upper surface striate, sometimes with a thin limbus internus reaching from the edge of the skirt-like partial veil to the stipe; universal veil as a large, white or whitish to pale yellowish or tannish (to 4A4) tubular volval sac, rather thick, leathery, less than 30% of sac below soil surface, distance from base of stipe to highest point of limb 50 - 60 mm, breadth 35 - 50 mm, with limb free for at least two-thirds of its length. Odor none. Taste mild. Macrochemical reactions: NH_4OH, negative in all parts. $FeSO_4$, negative on pileus. KOH, yellow—3A3-4 on disk, 3A2 on pileus margin, 3A2 on gills, 3A2-3 on stipe apex, 3A3 on stipe flesh, 3A2 on stipe base. Considered edible.

PILEIPELLIS: 120± μm thick; densely interwoven branching filamentous undifferentiated hyphae partially gelatinizing, 1.5 - 13.0 μm diam, dominantly subradially arranged; branching oleiferous hyphae present, 3.2 - 9.8 μm diam. PILEUS CONTEXT: loosely interwoven branching filamentous undifferentiated hyphae plentiful, 1.8 - 6.5 μm diam, with ventricose intercalary segments to 30 μm diam; inflated cells ovoid to broadly clavate to clavate, to 130 × 79 μm, thin-walled,

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[2] Color codes of the form 3A2 are from Kornerup & Wanscher (1978). Color codes of the form 10YR 7/8 are from Munsell Color (1975).

plentiful; oleiferous hyphae scarce to absent. LAMELLA TRAMA: obscurely bilateral (if at all), very narrow, often difficult to reinflate; branching filamentous undifferentiated branching hyphae 1.0 - 20.0 µm diam; inflated cells thin-walled, difficult to reinflate, to 44 × 37 µm; oleiferous hyphae present, 2.5 - 4.5 µm diam. SUBHYMENIUM: difficult to reinflate and observe; apparently a tangle of hyphae running subparallel to hymenial surface and directly connected to basidia or connected to basidia via slightly inflated, thin-walled, hyphal segments or small subglobose or ellipsoid cells, the latter with major axis parallel to hymenial surface. BASIDIA: 31 - 53 × 10.8 - 15.5 µm, mostly 4- and occasionally 3- or 2-sterigmate, thin-walled; clamps relatively common. UNIVERSAL VEIL: Exterior of sac at stipe base: gelatinized filamentous undifferentiated hyphae, in parallel groups or fascicles, orientation probably longitudinal, 1.4 - 9.8 µm diam; immediately below the surface, the hyphae lose the parallel orientation and become tangled and interwoven; oleiferous hyphae common 4.5 - 9.1 µm diam, branching, locally in tangled knots. Interior layer on stipe base: dominated by branching filamentous undifferentiated hyphae 2.1 - 10.5 µm diam, interwoven among inflated cells, often forming fascicles; inflated cells clavate to 143 × 37 µm, subglobose or ovoid to 161 × 95 µm; oleiferous hyphae 2.1 - 11.2 µm, common; clamps present and rather frequent. Inner surface of sac at stipe base: gelatinized hyphae; a few loose inflated cells, not completely reinflated, to 39 × 24.5 µm, possibly representing an inner layer composed almost entirely of inflated cells and left on pileus; oleiferous hyphae 1.4 - 21 µm diam, branching, common. On pileus surface: none found on material available (all mature specimens). STIPE CONTEXT: acrophysalidic; dominated by longitudinally oriented filamentous undifferentiated hyphae 4.0 - 14.5 µm diam; acrophysalides rather narrow, clavate to ovoid, to 162 × 43 µm; oleiferous hyphae present, 4.0 - 20.3 µm diam. PARTIAL VEIL: composed entirely of subparallel radially oriented filamentous undifferentiated hyphae. All tissues hyaline to pale yellow in 10% NH_4OH and 3% KOH.

BASIDIOSPORES: [100 measured from 3 specimens from 3 collections] (6.5-) 9.2 - 12.5 (-14.8) × (5.8-) 8.0 - 10.5 (-12.0) µm, (average length per specimen = 10.1 - 10.7 µm; average length (overall) = 10.3 µm; average width per specimen = 8.7 - 9.3 µm; average width (overall) = 9.0 µm; Q = (1.02-) 1.06 - 1.24 (-1.39); average Q per specimen = 1.14 - 1.15; average Q (overall) = 1.15), amyloid, hyaline, thin-walled, subglobose to broadly ellipsoid, occasionally globose or ellipsoid, frequently adaxially flattened; apiculus sublateral, cylindrical; contents guttulate; white with very slight pink tint in deposit.

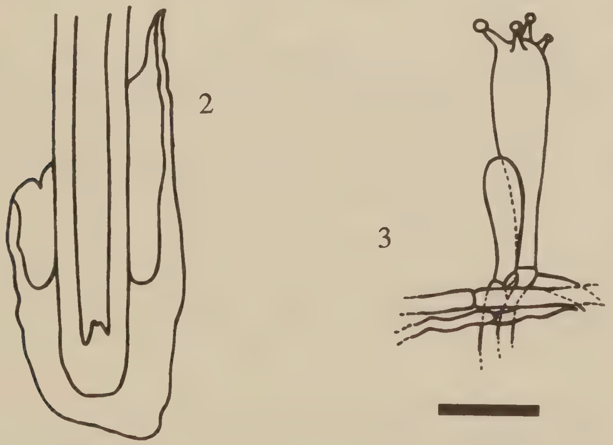
Distribution and habitat: In troops in July to September in central Nepal in *Shorea robusta* Gaertn. forest.

Collections examined: **NEPAL**: CHITWAN DISTRICT—Jugedi - vii.1986 Hemanta Ram Bhandary s.n. (NHMTU 02837 & RET), 12.vii.1990 H. R. Bhandary Ha (isotype, NHMTU & RET), Hb (holotype, NHMTU; isotype, NY).

DISCUSSION

The two species of *Amanita* most similar to *A. chepangiana* have been placed in section *Amidella* by previous authors (e.g., Gilbert (1940-41) and Hongo (1982)). They can be distinguished from *A. chepangiana* as follows:

— *Amanita neoovoidea* Hongo was described originally from Japan, but also has been collected in Sichuan Province, China and, very recently, in Nepal. (The taxonomy and distribution of *A. neoovoidea* will be discussed in a forthcoming paper by the present authors with Dr. T. Hongo, Ôtsu-city, Japan.) *Amanita chepangiana* and *A. neoovoidea* both have a robust, membranous universal veil with a tendency to turn yellowish or yellow-orangish; both universal veils have an underlayer of pulverulent white material that can be found on the pileus of young specimens; and both are considered edible by the peoples of the regions in which they occur. Quite often, the membranous portion of the universal veil of *A. neoovoidea* is left in large part on the pileus, as a calyptra or a group of rather large fragments. This has not been the case in any of the *A. chepangiana* specimens seen. In *A. neoovoidea* the pileus margin is not so strongly striate as in *A. chepangiana*, and the stipe of *A. neoovoidea* has a true bulb at its base. The spores of *A. neoovoidea* are smaller and less rounded than those of *A. chepangiana*. In our examination of Chinese, Japanese, and Nepali collections of *A. neoovoidea* to date (including the holotype (TNS)), the spores [238 from 11 specimens from 9 collections] have been found to be (5.8-) 6.8 - 9.8 (-12.0) × (4.2-) 4.8 - 6.5 (-7.5) µm with average Q per specimen = (1.29-) 1.36 - 1.53. *Amanita neoovoidea* has a number of anatomical features differing from *A. chepangiana* including a subhymenium composed of plentiful, rather large, inflated cells and lacking hyphae running parallel to the hymenial surface. There is also an ecological difference—*A. neoovoidea* is usually associated with members of the *Fagaceae* or occurs in mixed forests containing such trees. *Amanita neoovoidea* has never been reported associated with *Shorea*. It is worth noting that the distribution of *Shorea* in Nepal is such that it occurs infrequently above 700 m elev and never above 1000 m elev; on the other hand, *Quercus* occurs from 1000 - 3000 m elev in Nepal.



Figs. 2-3 *Amanita chepangiana*. 2. Cross-section of stipe base and universal veil (Bhandary Ha). 3. Portions of hymenium and subhymenium (holotype). The bar in Fig. 3 represents 20 µm.

— *Amanita ovoidea* (Bull.:Fr.) Link also has a pulverulent layer below a membranous universal veil. It differs from *A. chepangiana* in its often more robust stature; nonstriate, densely appendiculate pileus margin; thick, dense, partial veil with a creamy-floury consistency; often truncate lamellulae; a subhymenium the elements of which are perpendicular to the hymenial surface; etc. Tulloss has examined French (autumn.1886 J.-B. J. J. Barla s.n. in NY) and Italian (I. Filippi 2074 in RET) material of *A. ovoidea* and found the spores [35 from 2 specimens from 2 collections] to be (6.3-) 8.9 - 10.0 (-15.0) × 4.9 - 7.0 (-8.4) µm with average Q per specimen = 1.48 - 1.52.

The structure of the subhymenium in *A. chepangiana* has now been seen in a number of species of *Amanita* that are not closely related (Tulloss, 1991).

We place *A. chepangiana* in section *Amidella.*

Bhandary has interviewed a number of informants in the Jugedi area including Gurung and Chepang peoples and has collected the following data:

When *A. chepangiana* is collected for food, all stages from the button to the mature are included. All parts except the volval sac are utilized. A common means of preparing *A. chepangiana* for the table is as follows: Break the fruiting bodies into small pieces with the fingers or cut it in small pieces with a knife. Rinse the pieces to remove all remnants of soil or debris. Add the pieces to a scant amount of very hot cooking oil and mix with a selection of crushed spices including cumin seed, coriander seed, turmeric powder, a few *Zanthoxyllum* fruits, garlic and red chili (*Capsicum frutescens* L.). Cook for 5 - 10 minutes; then add a little water and simmer for 10 minutes. Serve.

Amanita chepangiana is sometimes offered for sale to hotel keepers who prepare meals for travelers along the highway in Jugedi. It is considered an highly favored edible by the Chepang people.

Amanita chepangiana is said to be very common around Jugedi only between the second week of May and the last of June (late spring and early monsoon seasons). It is said to be as tasty and abundant as an undetermined mushroom close to *Amanita hemibapha* (B. & Br.) Sacc. which fruits at the same time. Together, they are so abundant in the Jugedi forest area that, in spite of being prized edibles and the many persons seeking them, many of them go uncollected.

Some poor persons, who have no alternative but to take the readily available *A. chepangiana* as their staple food during its season, eat it three or four times a day without adverse effects. However a few children below 10 years of age are believed to be affected with a kind of intestinal disturbance called *karkaley maasi* (in Nepali), a disease with symptoms similar to those of Giardiesis with frequent discharge of slimy bowels.

The Chepangs call *A. chepangiana vaam waaum moo* or *vaam waaum*; and they call the entity close to *A. hemibapha yaar waaum moo* or *yaar waaum.* In the Chepang dialect, *vaam* means ''white''; *yaar* means ''yellow''; and *moo* means ''mushroom''. The Gurung name for both of these fungi is *naagfum.* A common name for *A. chepangiana* in Nepali is *seto kukhura phooley chyaau* (white egg mushroom). The *hemibapha*-like entity is called *pahe:lo kukhura phooley chyaau* (yellow egg mushroom) in Nepali. The ":" represents a nasal sound.

In the Jugedi area, there is reported to be another edible entity, probably belonging in *Amanita*, and which is said to be very rare and available during early monsoon to, perhaps, mid-monsoon. According to Bhandary's informants, this mushroom is slightly tastier than the two discussed above, is white, and has a shorter stipe than *A. chepangiana*. The Chepang refer to this entity as *miloo* (smaller) *vaam waaum moo*.

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LITERATURE CITED

Gilbert, E. J., 1940-41. *Amanitaceae. Iconographia Mycologia* 27: xx+427 pp. + pl.
Hongo, T. 1982. The Amanitas of Japan. *Acta Phytotaxonomica et Geobotanica* 33: 116-126.
Kornerup, A. and J. H. Wanscher. 1978. *Methuen handbook of colour*. London. 252 pp.
Munsell Color. 1975. *Munsell soil color charts*. Baltimore.
Tulloss, R. E. 1991. *Amanita morrisii*—history, taxonomy, and distribution. *Mycotaxon* 40: 281-286.

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NEW OR NOTEWORTHY DISCOMYCETES. 2. FIVE NEW OPERCULATE DISCOMYCETES [PEZIZALES] FROM THE DOVRE MOUNTAINS, CENTRAL SOUTH NORWAY.

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SUMMARY

Five operculate discomycetes are described as new: Helvella dovrensis T. Schum., Cheilymenia chionophila T. Schum., Cheilymenia sclerotiorum T. Schum., Iodophanus hyperboreus T. Schum. and Octospora heterosculpturata T. Schum. Ecological and chorological data of the pertinent species are given.

INTRODUCTION

Over the last ten years a number of interesting collections of alpine, operculate discomycetes have been examined and described. This paper, which is the second in a series on 'New and noteworthy discomycetes' (Schumacher 1990), takes the opportunity to discuss five new species from alpine habitats in Norway.

MATERIALS AND METHODS

Microscopic investigations were carried out on fresh collections, where available and on dried specimens which were rehydrated in water. Studies of apothecia were made by using squash mounts and sections cut either by hand or on a microtome. Apothecia were fixed in formalin-aceto-alcohol (5 ml formalin, 5 ml glacial acetic acid, 90 ml 70% ethyl-alcohol), then dehydrated in a graded butyl alcohol series, embedded in paraffin, and sectioned at 8-10 μm thickness. Observations were made in water, Melzer's reagent, methyl blue in lactic acid (Cotton blue) and safranin-fast-green; the staining of apothecial sections in safranin-fast green follows the protocol of Johansen (1940). Photomicrographs were taken with a 35 mm camera on a Zeiss WL microscope. The ascospore surface was investigated in a Jeol JSM-35C scanning electron microscope. Cover glasses with ascospore discharges from the pertinent species were placed directly on the SEM stubs in a drop of silver solution, and sputtered with gold-palladium in an argon atmosphere.

DESCRIPTIONS

Helvella dovrensis sp. nov. Figurae 1, 2

Apothecia stipitata, cupulata vel lobis recurvis vel sensim applanata, 1-2 cm longus, 0.8-1.8 cm in diam. Hymenium atrum. Receptaculum concolore. Stipes 0.5-1.5 cm longus et 0.3-0.5 cm crassus, aliquantum compressus, sulcis longitudinalibus, irregularibus, prope basim pallidior. Stratum externum excipuli 70-150 μm crassum, e cellulis angularis vel prismaticus. Stratum internum excipuli 170-300 μm crassum e hyphis 3-8 μm crassis. Subhymenium 30-70 μm crassum ex hyphis ad modum dense intricatis. Asci cylindracei, octospori, 250-320 x 14-18.5 μm magnis. Ascosporae hyalinae, ellipsoideae, laeves, polis rotundatis, 16.5-18.2 x 11.5-13.5 μm magnis. Paraphyses filiformes, 3-4 μm crassae, apicaliter sensim clavuliformiter incrassatae. Habitat ad terram nudam argillosam in alpibus Norvegiae et Europeae centralis.
Typus: Norway. Oppland. Dovre. Grimsdalen. Tverrliseter 5 August 1989 T. Schumacher 54/89 (O - **holotype**)

Apothecia with a distinct cup and stipe, 1-2 cm high, 0.8-1.8 cm broad, cup laterally compressed, forming irregular lobes with a recurved and often undulate margin; hymenium and external surface black except the base, which is greyish and may have small white areas next to stipe; outside covered with greyish white scaly tufts, which become larger and paler towards the margin. **Stipe** 0.5-1.5 cm high, 0.3-0.5 cm wide, often compressed, greyish black, being paler below and nearly white at the base, with single or indistinctly double blunt-edged ribs, which may continue shortly on to the cup or not. **Ectal excipulum** 70-150 μm thick, of textura angularis to textura prismatica, 5-8 cells deep, cells turning out perpendicularly to receptacular surface, hyaline or with pigmented walls, outermost cells club-shaped, 16-30 x 5-15 μm; outside towards the margin there are clusters of greyish pigmented, 3-8 celled hairs, 40-120 μm long, 10-22 μm broad, building the granular 'warts'. **Medullary excipulum** of interwoven textura intricata, 170-300 μm thick, innermost hyphae 3-4 μm broad, outermost hyphae approaching ectal excipulum 5-8 μm broad. **Subhymenium** of textura intricata, 30-70 μm thick, of more dense short-celled inflated hyphae, 6-10 μm broad. **Asci** cylindric, 8-spored, 250-320 x 14-18.5 μm, with a short acrorhynchous base. **Ascospores** ellipsoid, rounded, 16.5-18.2

x 11.5-13.5 µm, with one large central globule and two to four minute polar globules. **Paraphyses** straigth, septate, 3-4 µm broad, at the tips globularly enlarged to 6.0-8.0 µm, on outside of walls with granular brownish-black, incrustrated pigments.

Etymology: pertaining to the Dovre mountains of Central Norway, the type locality, where the species has been observed over the last few years.

Ecology and chorology: Helvella dovrensis has been found in calcareous schist areas in the Norwegian mountains and the European Alps; in the Dovre area it has been collected at elevations of 900-1250 m in eroded Dryas - vegetation and in solifluction lobes. Helvella corium is a frequent accompanion of the species. Helvella dovrensis is probably a true member of the alpine mycoflora of Fennoscandia and the Alps; its eventual distribution within the Arctic is unsettled.

Specimens examined:

Norway. Oppland. Dovre. Grimsdalen at the Tverråi estuary, on the river terraces, 24 July 1983 T. Schumacher D 50/83 (O); Tverrgjelet 1050 m, in Dryadetum, 8 August 1983 T. Schumacher D 113/83 (O), 26 July 1984 T. Schumacher D 69/84 (O); Grimsdalen 500 m SW Verkenseter, 1000 m, 18 September 1983 T. Schumacher D 191/83 (O), on the river bed of Grimsa, 26 July 1984 T. Schumacher D 71/84 (O); Tverrliseter, 16 September 1983 T. Schumacher D 234/83 (O), 5 August 1989 T. Schumacher 54/89 (O - **holotype**); Grimsdalshytta, road verges, 1000 m, 3 August 1989 T. Schumacher TS 15/89 (O); Tverråi, on the river slopes , ca 970 m, 5 August 1989 T. Schumacher TS 71/89 (O); Grimsdalen at the Buåi estuary, 940 m a.s.l., 18 July 1986 T. Schumacher TS 3/86 (O), 5 August 1989 T. Schumacher TS 49/89 (O).
Switzerland. Graubünden. Igls Plans, Albulapass, 2400 m, 30 August 1984 T. Schumacher (O); ?Mt. Schombrius, 19 August 1990 leg. E. Horak (O).
Austria. Tirol. Ötztal. Timmelsjoch, 2550 m, 23 August 1990 T. Schumacher (O).

Notes: The investigated specimens may coincide with material described as H. queletii Bres. var. alpina Heim & Remy (1932) and H. corium (Weberb.) Massee f. alpestris (Boud.) Favre sensu Favre (1955), from the French and Swiss Alps, respectively. The new epithet 'dovrensis' is proposed. A frequent accompanion in the Dovre area is H. corium, which is similar, but the cup-shaped pileus is more regular and the stipe is unfurrowed, cylindrical. H. ulvinenii Harmaja and H. dryadophila Harmaja seem to share gross morphological, ecological and chorological features with H. dovrensis; these two species have, according to the descriptions, brownish black hymenium colours (Harmaja 1977, 1978, 1979).

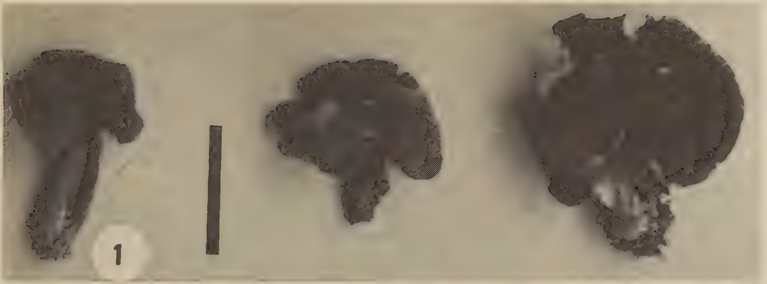
Cheilymenia chionophila sp. nov. Figurae 3, 4

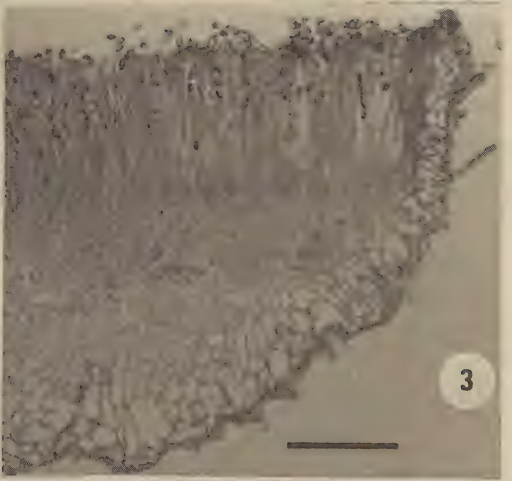
Apothecia sparsa vel fasciculata, sessilia, cupuliformia vel repanda, 3-7 mm lata, hymenio luteo-aurantiaco, margine distincto, extus similari, pilis dense dispositis. Stratum externum excipuli 75-200 μm crassum, e cellulis angularis vel globosis, usque ad 25-65 μm magnis. Stratum internum excipuli 60-180 μm crassum e hyphis 4-8 μm crassis. Subhymenium 35-65 μm crassa, e cellulis parvis dense intertextis. Pili pallide brunnei, simplices, pluri-saeptati, rectae vel flexuosus, cum apice subacuto, 50-300 (-470) μm longi, 10-30 μm lati, basi simplices vel breviter bi-furcati, pili superficiales ad bases a cellulis bulbiformibus excipuli exterioris portati. Asci cylindracei, octospori, 200-230 x 11.5-14.5 μm magnis. Ascosporae uniseriatae, ellipsoideae, hyalinae, eguttulatae, laeves, 16.2-18.4 x 9.2-10.8 μm. Paraphyses simplices, ca. 2.5 μm crassae, pigmentum aurantiacum continentes, apice incrassatae, 6-11.2 μm. Habitat terricola.
Typus: Norway. Oppland. Dovre. Grimsdalshytta, on plant debris and sand along road verge 29 June 1984 T. Schumacher D 33/84 (O - **holotype**)

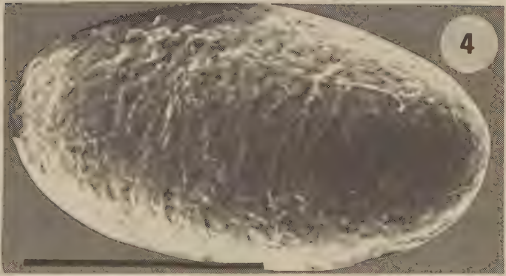
Apothecia solitary or gregarious, cup-shaped, 3-7 mm diam., hymenium yellow orange; outside concolourous, with a raised margin, densely set with subhyaline to light brown stiff and flexuous hairs. **Ectal excipulum** 75-200 μm thick, of textura globulosa-angularis, 4-8 cells wide, cells 25-65 μm in diam, outer cells slightly elongate, turning out perpendicularly to receptacular surface. **Medullary excipulum** 60-180 μm thick, of densely packed short-celled hyphae and partly loose, interwining few-septate hyphae, 4-8 μm broad. **Subhymenium** 35-60 μm wide, of densely packed, prismatic cells. **Apothecial hairs** numerous; subhyaline, thin-walled as well as brownish, thick-walled with one to four proximal septa, occasionally with one distal septum, brownish to subhyaline, arising from swollen, superfiscial excipular cells or from a prominent bifurcate root seated deeper into the excipulum, 50-300 (-470) μm long, 10-30 μm broad, straight or slightly flexuous, bifurcate hairs exceptionally observed. **Asci** cylindric, 8-spored, 200-230 x 11.5-14.5 μm, arizing from croziers. **Ascospores** uniseriate, ellipsoid, hyaline, eguttulate, smooth, 16.2-18.4 x 9.2-10.8 μm, perispore separates and float around the spore wall proper when mounted in lactic acid and slightly heated. **Paraphyses** straight, ca 2.5 μm broad, containing orange, granular pigments staining green in Melzer's reagent, pyriformly enlarged to 6-11.2 μm at the tips.

Etymology: pertaining to the chionophilous habit of the fungus.

Ecology and chorology: This soil-inhabiting Cheilymenia species appears in low and middle alpine snow bed communities in early summer (late June), and continue to fruit until late August. In the Dovre mountains its vertical distribution is from the subalpine to the mid- alpine zones (900 - 1450 m a.s.l.). It is found on naked soils, e.g. river beds, road verges, or is associated with herb remnants and tufts of grasses. It constitutes a chionophilous, high summer representative of the arctic-alpine discomycete flora of Fennoscandia and the Central European Alps.







Figs 1-2. Helvella dovrensis (from holotype - O). Fig. 1. Fresh ascocarps; bar = 1 cm. Fig. 2. Median section of hymenium and excipulum; bar = 100 μm. Figs 3-4. Cheilymenia chionophila. Fig. 3. Median section of apothecium (TS D 57/82 - O); bar = 100 μm. Fig. 4. SEM graph of ascospore (TS D 16/84 - 0); bar = 10 μm.

Specimens examined:

Norway. Hordaland. Ulvik. Finse. At the pathway to Blåisen, 1280 m, 7 August 1960 F.-E. Eckblad no 60/14 (O), same locality, 1400 m, 13 July 1988 T. Schumacher (O); Finse. Finseskaret, 1300 m, 6 August 1960 F.-E. Eckblad no 60/10. Oppland. Dovre. Grimsdalen. NE Kattuglehøi, 1340 m, in moist spring horizon, 7 August 1982 T. Schumacher 33/82 (O); NE Kattuglehøi at Tverråi, 1150 m, 7 August 1982 T. Schumacher 57/82 (O); Gautåa at Veslhjerkinntjønnin, 1200 m, on sandy soil at the river, 10 August 1982 T. Schumacher 246/82 (O); same locality and date 251/82 (O); Svartknattin at Hornsjøhøi, 1380 m, 11 August 1982 T. Schumacher 286/82 (O); Gråsida W, 1400 m, spring vegetation, 21 July 1983 T. Schumacher D 43/83 (O); Grimsa at Storberget, on sandy soil in river bed, 980 m, 27 June 1984 T. Schumacher D 16/84 (O); Grimsdalshytta, road verges, 26 June 1984 T. Schumacher D 17/84 (O), same locality, 29 June 1984 T. Schumacher D 33/84 (O- **holotype**); Grimsa at Verkenseter, along rivulet, 28 June 1984 T. Schumacher D 18/84 (O); Vegaskillet, 1240 m, 24 July 1984 T. Schumacher D 38/84 (O); Grimsdalen at Tverråi, 930 m a.s.l., 7 August 1989 T. Schumacher TS 65/89 (O). Vågå. Vågåmo. the pathway to Blåhø, 1000 m, 22 July 1988 R. Kristiansen (O). Hallingskarvet July 1987 Ø. Weholt (O). Sør-Trøndelag. Oppdal. Midtre Knutshø, 1450 m, snow bed, 8 August 1984 T. Schumacher TS 12/84 (O). Troms. Nordreisa. Reisadalen at Gætkevuobme, 10 August 1985 H. Sætran (O). Finnmark. Kautokeino. Vuorasjavvre, in calciphilous snow bed, 1 August 1975 T. Schumacher 82/75 (O).
Switzerland. Graubünden. Val Sesvenna, 2360 m, on silt and plant remnants along river, 31 August 1984 T. Schumacher H 54, H 55 (O).
Austria. Tirol. Ötztal. Timmelsjoch, 2520 m, snow bed community, 23 August 1990 E. Ohenoja A 16/90 (O).

Notes: This bright yellow-orange soil-inhabiting species belong in the species complex around Cheilymenia villosa Gamundí (1972, 1975). Following the infrageneric classification proposed by Moravec (1990), it merges in the section Villosae.

Cheilymenia sclerotiorum sp. nov. Figurae 5, 6, 7, 8

Apothecia mediocria, orbicularia, sessilia vel substipitata, e sclerotiis crescentia, primum cupulata, dein patellaria, 4-12 mm diam., hymenio luteo-aurantiaco vel aurantiaco, extus similari, pilis tenuis copiose vestita, subhyalinis vel fuscus. Sclerotia rufo-brunnea, 1.5-4 x 1.5-3.2 mm magnis, e cellulis angularis vel globosis composita. Stratum externum excipuli 130-220 μm crassum, e cellulis angularis vel globosis, usque ad 25-70 μm magnis. Stratum internum excipuli 40-120 μm crassum e hyphis 4-6 μm crassis. Subhymenium indistinctum , e cellulis parvis dense intertextis. Pili marginales et superiores longiores, simplices, pluriseptati, subacutes, basi bulbosi aut bifurcati, 70-380 μm longi, 15-25 μm lati, pili inferiores flexuosi usque recti, subhyalini usque subfusci, 40-150 x 4-10 μm magnis. Asci cylindracei, tetra- vel octospori, 180-220 μm

longi, 10-14 µm lati. Ascosporae uniseriatae, ellipsoideae, eguttulatae, laeves, 15.8-18.4 x 8.6-10.4 µm. Paraphyses, pluriseptatae, 3.2-4.0 µm crassae, pigmentum aurantiacum continentes, apice rectae, incrassatae, 7-11 µm. Habitat terricola et muscicola.
Typus: Norway. Dovre. Oppland. Kattuglehøi W, in minerotrophic fen, 1410 m, 12 August 1981 T. Schumacher 104/81 (O-**holotype**)

Apothecia substipitate, broadly saucer-shaped to shallow cup-shaped, 4-12 mm diam., 4-10 mm high, arising from brownish, tuberoid sclerotia, 1.5-4.0 x 1.5-3.2 mm; hymenium bright yellow-orange, brownish when dried, outside concolourous, densely set with pale brown and subhyaline hairs. **Sclerotia** not differentiated in cortex and medulla, pseudoparenchymatic, of angular cells throughout, cells 20-42 µm in diam; sclerotial rind one or two cells wide, of narrow, thick-walled prismatic cells, 4-8 x 15-36 µm, oriented longitudinally to sclerotial surface. **Ectal excipulum** 130-220 µm thick, 3-5 cells broad, of angular to rounded cells, 25-70 µm in diam, outermost cells slightly elongated with their long axes turning out perpendicularly to the receptacular surface. **Medullary excipulum** 40-120 µm thick, of interwoven, short-segmented hyphae, 4-6 µm broad. **Subhymenium** indistinct, of densely packed hyphae, 3-6 µm broad. **Apothecial hairs** numerous, principally of two types: 1) - stiff, broad, thick-walled, subhyaline to brownish, one to many-septate hairs, 70-380 µm long, at base 15-25 µm broad, base simple or bifurcate, originating from outer or inner cells of the ectal excipulum, -- 2) - flexuous, subhyaline, thin-walled, narrow hairs, 40-150 µm long, 4-10 µm broad, arising from outermost excipular cells. **Asci** cylindric, 4- to 8-spored, 180-220 x 10-14 µm, arising from croziers below. **Ascospores** uniseriate, ellipsoid, eguttulate, smooth, 15.8-18.4 x 8.6-10.4 µm, frequently with one or two deBary bubbles, spots on spore wall taking colour in Cotton blue, giving a false ornamentation of irregular patches and short lines on the spore wall, perispore loosens and floats around the spore when mounted and slightly heated in lactic acid. **Paraphyses** slender, straight, septate, simple or branched from below, filled with orange yellow granules, 3.2-4.0 µm broad, at the tips enlarged to 7-11 µm.

Etymology: pertaining to the growth habit; apothecia originate from distinct sclerotia.

Ecology and chorology: Among bryophytes in rich, minerotrophic fens, frost holes and spring horizons; the sclerotia are superficially attached to mosses such as Drepanocladus revolvens, D. exannulatus and Calliergon species. Cheilymenia sclerotiorum has been found in two mountain areas of South Norway, in Oppland-Sør-Trøndelag and Hordaland counties. In both places it occurs in the low and mid-alpine zones at high elevations, 1100 -1450 m. Its occurrence outside Norway is unknown.

Specimens examined:

Norway. Hordaland. Ulvik. Finse. Pathway to Blåisen, 1250 m, 7 August 1960

F.-E. Eckblad no 60/12 (O), Finsevatn, 1340 m, 10 August 1963 F.-E. Eckblad no 60/33. Jomfrunut, 1310 m, 30 August 1981 T. Schumacher (O); Eidfjord. East of Stigstuv, 1300 m, 7 August 1981 E. Bendiksen 597/81 (O). Oppland. Dovre. Kattuglehøi W, in minerotrophic fen, 1410 m, 12 August 1981 T. Schumacher 103/81 (O), 104/81 (O - **holotype**); 25 July 1984 T. Schumacher D 56/84 (O); Svartknattjønnin, in rich, minerotrophic fen, 1410 m, T. Schumacher D 41/84 (O), D 42/84 (O); same locality, 3 August 1989 TS 13/89 (O); Veslhjerkinntjønnin, rich minerotrophic fen, 1210 m, 28 July 1984 T. Schumacher D 93/84 (O). Sør-Trøndelag. Oppdal. Midtre Knutshø, 1450 m, 8 August 1984 T. Schumacher TS 11/84 (O).

Notes: The bright yellow-orange apothecia, borne on large, brownish sclerotia makes this species easy to recognize. Cheilymenia sclerotiorum also shares characteristics with Pseudaleuria quinaultiana (Lusk 1987). The generic limits between Cheilymenia and Pseudaleuria are not clear. The brown sclerotia in C. sclerotiorum consists of undifferentiated, angular cells throughout and differs fundamentally in internal strucure from 'true' sclerotia, such as observed in certain members of the Sclerotiniaceae. The nature of the sclerotium in C. sclerotiorum is probably not the purposes of supplying moisture and nutriments, but may rather serve as a resistant structure to carry the fungus through its extreme alpine environments. Sclerotial formation is very uncommon in the Pezizales. Sclerotia have been found in species of Morchella (Boudier 1897, Gilbert 1960), Wynnea (Korf 1949, Rosinski & Korf 1954, Korf 1972, Pfister 1979), Pyronema (Rosinski & Korf 1954, Moore 1962), Fimaria (Hansen 1876, Pfister 1984, Benkert 1988), Pseudaleuria (Lusk 1987), and in Humaria peckii House (? = Octospora peckii (House) Khare & Tewari) (House 1919).

Iodophanus hyperboreus sp. nov. Figura 9

Apothecia parva, sessilia, solitaria, subglobosa vel pulvinata, 0.5-1.5 mm lata, extus fibrillosa, hymenio subsalmoneae. Stratum externum excipuli 60-85 μm crassum, e cellulis angularis vel globosis. Stratum internum excipuli 50-90 μm crassum e hyphis 6-12 μm crassis. Subhymenium 30-40 μm crassa, e cellulis parvis dense intertextis. Asci clavatae vel subcylindracei, octospori, 160-240 μm longi, 14-18 μm lati, omnino manifesto amyloides, maturi prominentes. Ascosporae juvenes bi-tri-seriatae, mox uniseriatae, hyalinae, ellipsoideae, uniguttulatae, polis rotundatis, 18-20.8 x 10.4-11.4 μm magnis, tunica sat subtiliter verrucosa, verrucis singularibus vel sparse confluentibus, irregularibus, minutis, 0.3-0.7 μm crassis, 0.2-0.4 μm altis. Paraphyses filiformes, rectae,

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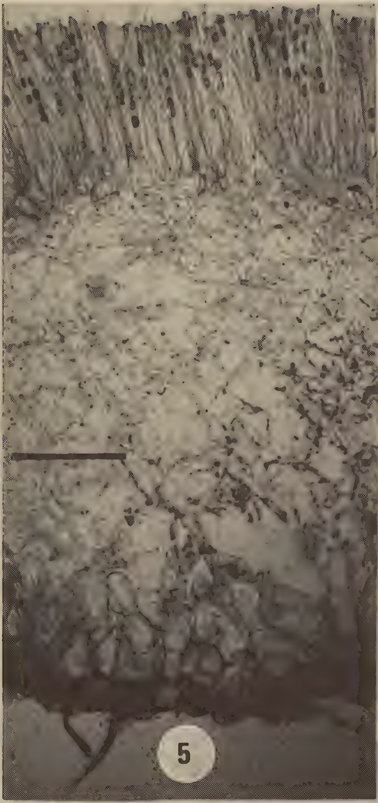
Figs 5-8. Cheilymenia sclerotiorum (O - from holotype). Fig. 5. Median section of hymenium and excipulum; bar = 100 μm. Fig. 6. Ascospore in SEM; bar = 10 μm. Fig. 7. Cross section of sclerotium; bar = 100 μm. Fig. 8. Cross section of sclerotium, showing prismatic rind cells and pseudoparenchymatic cortical cells; bar = 100 μm.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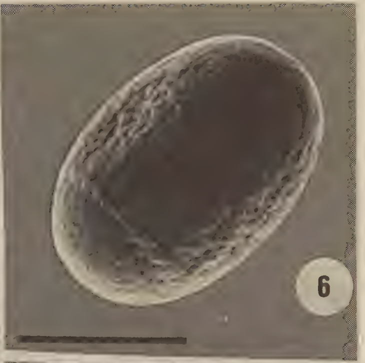
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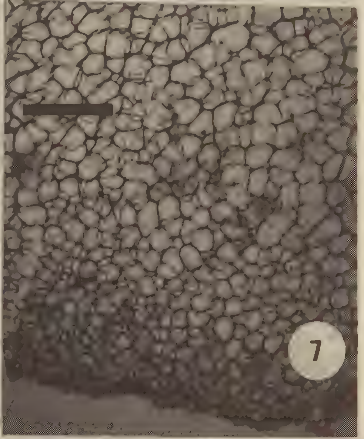
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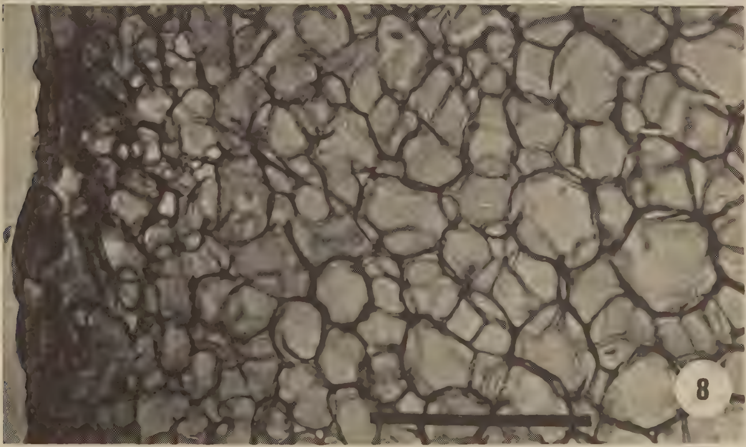
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septatae, sursum sensim incrassatae, 5-11 µm crassitudines attingentes, cytoplasma ad apices cum olei guttulis magnis. Habitat ad terram nudam argillosam.
Typus: Norway. Oppland. Dovre. Grimsdalen at Grimsa, 1000 m, 1 km SW Verkenseter, 5 August 1989 T. Schumacher TS 44/89 (O - **holotype**)

Apothecia scattered, at first subglobose, becoming lenticular to convex, 0.5-1.5 mm in diam., pinkish to salmon-coloured. Excipulum not sharply demarcated into ectal and ental layers, cells with pinkish granular contents. **Ectal excipulum** 60-85 µm thick, of angular to globose cells, cells 6-20 µm in diam., towards the margin cells more elongate turning out and upwards perpendicularly to receptacular surface, outermost cells giving rise to subhyaline, septate hyphoid hairs up to 30-50 µm long, by 3-6 µm wide. **Medullary excipulum** 50-90 µm wide, of densely packed, short-segmented, inflated hyphae running longitudinally to receptacular surface, hyphae 6-12 µm wide, cells 10-16 µm long. **Subhymenium** 30-40 µm wide, of dense, thick-walled, short-celled hyphae, towards margin running upwards and building an inner layer of the apothecial rind. **Asci** 8-spored, at first broadly clavate with ascospores bi-to tri-seriate in upper part of ascus, then asci elongate, subcylindric, slightly truncate above, 160-240 x 14-18 µm, with uniseriate ascospores, slightly protruding above the level of the hymenium at spore liberation; bluing in their whole length in Melzer's reagent. **Ascospores** hyaline, ellipsoid, rounded at the poles, 18-20.8 x 10.4-11.4 µm, ascospore wall sculptured, with distinct, and rarely confluent minute warts, 0.3-0.7 µm broad, 0.2-0.4 µm high, with one medium-sized central guttule. **Paraphyses** straigth, multiseptate, unbranched or branched from below, 2.0-3.0 µm broad, apices slightly flexed and inflated to 8-11 µm, with pinkish, granular pigments, in fresh specimens terminal cell with rows of conspicuous, medium-sized internal globules.

Etymology: pertaining to its chorological characteristics.

Ecology and chorology: This minute, pinkish species has been found on sand and silt along arctic-alpine rivers in Norway and in the high Arctic (Ny-Ålesund, Svalbard; Sdr. Strømfjord, Greenland (H. D., pers. comm.).

Specimens examined:

Norway. Oppland. Dovre. Grimsdalen at Grimsa, 1000 m, 1 km SW Verkenseter, 4 August 1983 T. Schumacher & K. Østmoe D 68/83 (O); same locality, 5 August 1989 T. Schumacher TS 44/89 (O - **holotype**); same locality, 11 August 1990 T. Schumacher (O).
Svalbard. Spitsbergen. Ny-Ålesund, on silt along river, 14 August 1988 H. Knudsen (O).

Notes: The genus Iodophanus was monographed by Kimbrough, Luck-Allen & Cain (1969), who included 10 species. Gross morphology and microanatomy of paraphyses and spores connect I. hyperboreus with I. carneus; this latter

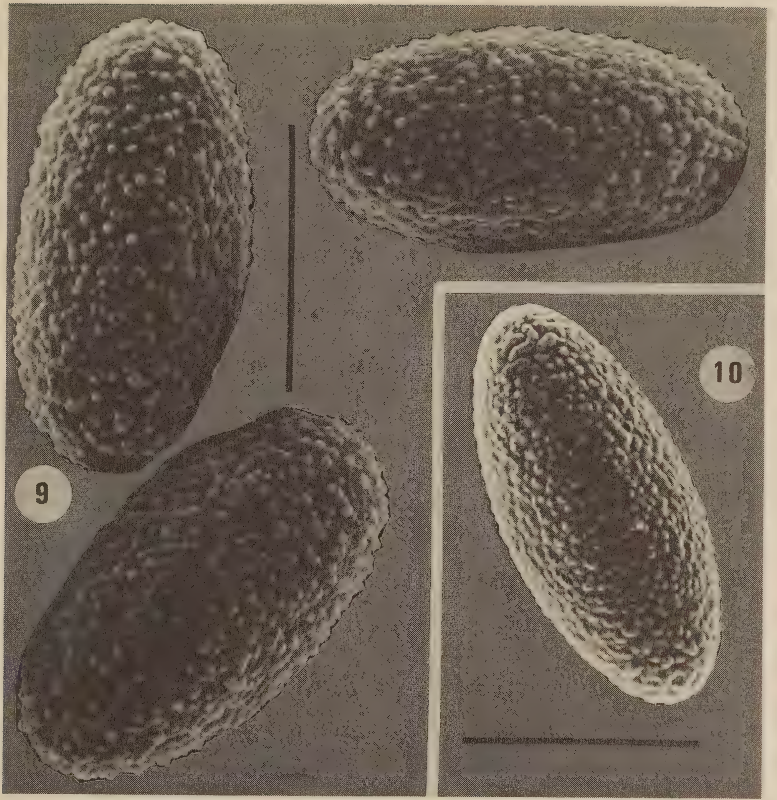


Fig. 9. Iodophanus hyperboreus. Ascospores in SEM (O - from holotype); bar =10 µm. Fig. 10. I. carneus. Ascospore in SEM (O-TS 147/83); bar = 10 µm.

species differs a. o. in having slightly pointed ascospores (cf. Fig. 10), minute warts and more inconspicuous internal globules of the paraphysal apices.

Octospora heterosculpturata sp. nov.

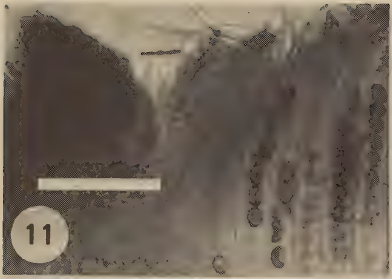
Figurae 11, 12, 13, 14

Apothecia sessilia, discoidea vel turbinata, 0.6-2 mm diam., margine distincto, fimbriata, disco aurantiaco. Excipulum e hyphis cylindraceis tenuiter tunicatis instructum, e hyphis 6-14 µm (textura intricata vel textura epidermoidea). Subhymenium e cellulis parvis dense intertextis. Asci cylindracei, 280-310 x 19-21 µm magnis. Ascosporae late ellipsoidea, hyalinae, 16.5-19.0 x 12.6-14.2 µm magnis, guttula unica magna impletae, tunica sat verrucosa, verrucis singularibus vel confluentibus, irregularibus, 0.4-1.2 µm crassis, 0.2-0.5 µm altis. Paraphyses filiformes, rectae, sursum sensim incrassatae, ad 7.4 µm latae, apice rectgae vel sparse curvatae. Habitat in Splachnio vasculosae vivo. **Typus: Norway.** Dovre. Persbekken N Hornsjøhøi, 1320 m a.s.l., 4 August 1989 TS 11/89 (O - **holotype**).

Apothecia sessile, 0.6-2 mm in diam., saucer-shaped, disc bright orange, slightly convex, with a prominent, raised margin, seated inbetween shoots of its host. **Ectal excipulum** of compactly interwoven multi-septate hyphae, 6-12 µm diam (a short-celled textura intricata to textura epidermoidea), towards the margin the cells become long-cylindrical and longitudinally oriented along receptacular surface, at margin terminating as cylindrical clavate cells up to 140 µm long, by 8-10 µm wide. **Medullary excipulum** not sharply differentiated from ectal excipulum, consisting of compactly interwoven, short-celled hyphae, 6-14 µm wide, 10-30 µm long. **Subhymenium** of short-celled hyphae, 4-7 µm wide. **Asci** cylindric, 280-310 x 19-21 µm, 8-spored; occasionally with 2-4 abortive spores dispersed inbetween the 6 to 4 mature ones in asci. **Ascospores** hyaline, broadly ellipsoid, 16.5-19.0 x 12.6-14.2 µm, containing one large, central globule; spore wall with isolated or partly confluent warts of irregular shape and size, 0.4-1.2 µm broad, by 0.2-0.5 µm high, densely and unevenly set on the spore wall. **Paraphyses** straight, septate, 2.7-3.2 µm broad, frequently branched from lower, mid- and upper third, gradually enlarged to 4.8-7.4 µm at the tips, which are bent or not.

Etymology: pertaining to the type of ascospore ornamentation, the sculpturing consisting of large and small warts of irregular shape.

Figs 11-14. Octospora heterosculpturata (O - from holotype). Fig. 11. Median section of apothecial margin; bar = 100 µm. Fig. 12. Detail of margin, composed of densely packed, 'hyphoid' hairs; bar = 100 µm. Fig. 13. Detail from hymenium, a.o. with degenerating ascospores within ascus; bar = 100 µm. Fig. 14. Ascospores in SEM; bar = 10 µm.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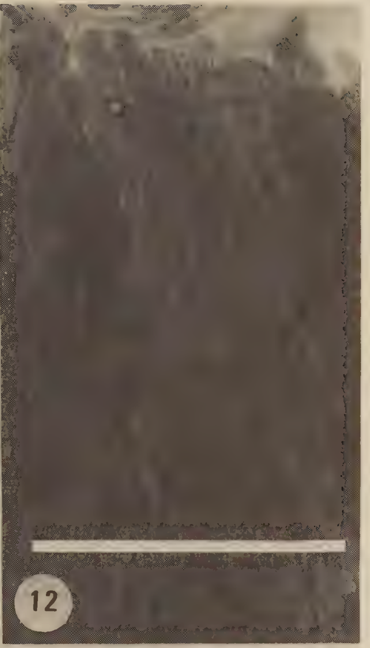
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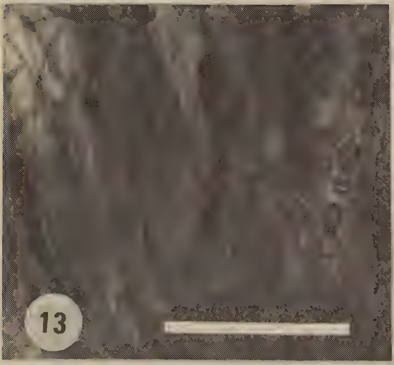
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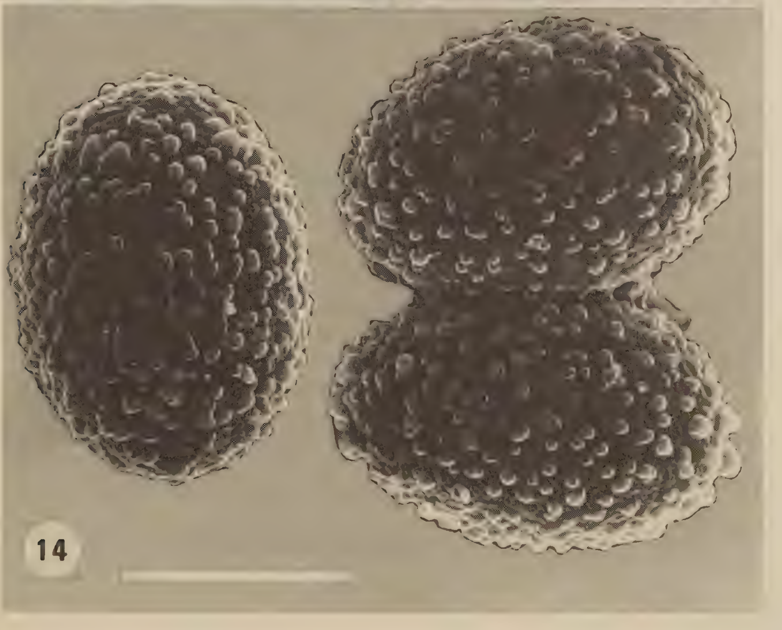
14

Ecology : In cushions of Splachnum vasculosum and Pohlia sp. on manured soils and dung of reindeer; apothecia appear inbetween the shoots of the host moss.

Specimen examined:

Norway. Dovre. Persbekken N Hornsjøhøi, 1320 m a.s.l., 4 August 1989 TS 11/89 (O - **holotype**).

Notes: This species is only known from the type locality in the Dovre mountains, Central Norway. The partly submerged, yellow-orange apothecia, the broadly ellipsoid ascospores, and the 'heterosculptured' ascospore wall, characterize this species. Octospora heterosculpturata is apparently close to O. moravecii Khare, which occurs together with Pohlia spp.; this latter species, however, has a. o. distinctly broader ascospores.

ACKNOWLEDGEMENTS

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REFERENCES

Benkert, D. 1988. Bemerkenswerte Ascomyceten der DDR. X. Fimaria ripensis (= F. hispanica). Boletus 11: 57-60. '1987'.
Boudier, E. 1897. Analytique des morilles de France. Bull. Soc. Mycol. France 13: 129-152.
Favre, J. 1955. Les Champignons supérieurs de la zone alpine du parc national suisse. Ergeb. wissensch. Unters. schweiz. Nationalparks 5(33): 1-212.
Gamundí, I. 1972. Discomycetes de Tierra del Fuego I. Especies nuevas o críticas del género Cheilymenia (Humariaceae). Bol. Soc. Arg. Bot. 14(3): 167-176.
Gamundí, I. 1975. Fungi, Ascomycetes - Pezizales. Fl. cript. Tierra del Fuego 10(3): 1-185.
Gilbert, F. A. 1960. The Submerged culture of Morchella. Mycologia 52: 201-209.
Hansen, E. C. 1876. Peziza ripensis n. sp. a sclerotio gignitur. Hedwigia 7: 97-98.

Harmaja, H. 1977. A revision of the Helvella acetabulum group (Pezizales) in Fennoscandia. Karstenia 17: 45-58.

Harmaja, H. 1978. New species and combinations in Helvella and Gyromitra. Karstenia 18: 57.

Harmaja, H. 1979. Studies on cupulate species of Helvella. Karstenia 19: 33-45.

Heim, R. & Remy, L. 1932. Fungi Brigantiani (3. série). Bull. Soc. Mycol. France 48: 53-75.

House, H. D. 1919. New or interesting species of fungi V. Bull. N. Y. State Mus. 205-206: 32-42.

Johansen, D.A. 1940. Plant microtechnique. McGraw Hill, New York.

Kimbrough, J., Luck-Allen, E. R. & Cain, R. F. 1969. Iodophanus, the Pezizeae segregate of Ascophanus (Pezizales). Amer. J. Bot. 56: 187-1202.

Korf, R. P. 1949. Wynnea americana. Mycologia 41: 649-651.

Korf, R. P. 1972. Synoptic key to the genera of the Pezizales. Mycologia 64: 937-994.

Lusk, D. E. 1987. Pseudaleuria quinaultiana, a new genus and species of operculate ascomycetes from the Olympic peninsula. Mycotaxon 30: 417-431.

Moore, E. J. 1962. The Ontogeny of the Sclerotia of Pyronema domesticum. Mycologia 54: 312-316.

Moravec, J. 1990. Taxonomic revision of the genus Cheilymenia - 3. A new generic and infrageneric classification of Cheilymenia in a new emendation. Mycotaxon 38: 459-484.

Pfister, D. H. 1979. A monograph of the genus Wynnea (Pezizales, Sarcoscyphaceae). Mycologia 71: 144-159.

Pfister, D. H. 1984. On Fimaria dentata, a new combination, with a review of synonyms and comments on Fimaria (Pezizales). Mycologia 76: 843-852.

Rosinski, M. A. & Korf, R. P. 1954. Sclerotia in an Operculate Discomycete. Science 119: 737.

Schumacher, T. 1990. New or noteworthy discomycetes. 1. Some stromatic fungi on Alnus or Betula. Mycotaxon 38: 233-239.

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DETERMINATION OF INFRASPECIFIC RELATIONSHIPS IN KLUYVEROMYCES MARXIANUS BY RIBOPRINTING

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ABSTRACT

Infraspecific relationships between varieties of *Kluyveromyces marxianus* were determined using riboprinting. The technique involves enzymatic amplification of the small subunit ribosomal RNA gene (SSU rDNA) and estimation of genetic distances from restriction fragment data. The SSU rDNAs from type cultures of *K. marxianus* and *K. polysporus* were amplified using the Polymerase Chain Reaction (PCR) and subjected to a battery of 11 restriction enzymes. Two varieties, *K. marxianus* var. *marxianus* and *K. marxianus* var. *wikenii*, exhibited identical restriction patterns. Cluster analysis revealed two major groups, one of which corresponded to the previously recognized *K. lactis*. Results were in general agreement with groupings deduced from other informational macromolecules and suggest that the treatment of all these varieties as infraspecific taxa of *K. marxianus* may not be warranted. Based on riboprinting and the results of previous studies, re-establishment of the species *K. lactis* is proposed.

INTRODUCTION

The genus *Kluyveromyces* as emended by Van der Walt (1965) includes fermentative yeasts that form variable numbers of ascospores in evanescent asci. In their most recent treatment of the genus, Van der Walt and Johannsen (1984) recognized 11 species, including *K. marxianus* which they grouped into seven varieties: 1) *K. marxianus* var. *bulgaricus*, 2) *K. marxianus* var. *dobzhanskii*, 3) *K. marxianus* var. *drosophilarum*, 4) *K. marxianus* var. *lactis*, 5) *K. marxianus* var. *marxianus*, 6) *K. marxianus* var. *vanudenii*, and 7) *K. marxianus* var. *wikenii*. These varieties were earlier considered to be separate species of *Kluyveromyces* (Van der Walt 1970) but were relegated to infraspecific taxa based on interfertility studies (Johannsen and Van der Walt 1978, Johannsen 1980). In 1986 Sidenberg and Lachance reported that isolates belonging to the *K. lactis* and the *K. marxianus* cluster were not phenotypically continuous with one another nor with the formerly recognized species *K. dobzhanskii*. Based on isoenzyme electrophoretic patterns, they proposed to reinstate these three taxa as distinct species. A later study by Vaughan Martini and Martini (1987) using nuclear DNA reassociation supports the groupings made earlier by Sidenberg and Lachance on the basis of isoenzyme data.

It has been suggested that a comparison of the ribosomal RNA of *Kluyveromyces* species may elucidate the degree of relatedness amongst the less nutritionally versatile species and their relationship to those with higher versatility (Fuson et al. 1987). Due to the presence of both highly conserved and variable regions, the small subunit ribosomal RNAs appear to be useful in determining phylogenetic relationships (Sogin and Gunderson 1987, Förster et al. 1990).

In this study, we determined relationships between varieties of *Kluyveromyces marxianus* (Hansen) van der Walt through the enzymatic amplification of the gene coding for the small subunit ribosomal RNA and analysis of restriction fragment length polymorphisms. The technique, which has been called riboprinting (Clark and Diamond 1991), detects differences between closely related taxa and can be a valuable tool for molecular taxonomy and strain characterization.

MATERIALS AND METHODS

Strains used. Nine strains of *K. marxianus* and one strain of the type species, *K. polysporus* were studied (Table 1). These include all the type cultures of *K. marxianus* varieties.

Cultivation of strains and preparation of DNA. Cells were grown overnight in 50 ml of YEPD medium (1% yeast extract, 2% peptone, 2% glucose) at 25C. At the end of the incubation period, cells were pelleted by spinning 35 ml of broth culture at 3,000 x g for 10 min. The pellet was then transferred aseptically into a sterile mortar and ground in the presence of approximately 20 ml of liquid nitrogen. After all of the nitrogen had sublimed, 900 μL of lysis buffer (50 mM Tris-HCl, 50 mM EDTA, 3% SDS and 1% Dithiothreitol) was added to the powder and the mixture was transferred to a 2.0 ml microcentrifuge tube. Contaminating organic compounds were sequentially extracted with phenol, phenol-chloroform (1:1), and chloroform. After isopropanol precipitation, the DNA was pelleted by centrifugation at 10,000 x g for 30 min, dried in a HetoVac for 10 min, and resuspended in 100 μL of distilled water. It was then treated with RNase Plus (5'→3') for 1 h, reprecipitated, and resuspended in 100 μL of distilled water for use as amplification target.

Table 1. Strains used for riboprinting. Type cultures are designated with a (T) after the ATCC number.

Strain	ATCC Number	Other Designation(s)
Kluyveromyces polysporus	22028 (T)	CBS 2163, ATCC 56499, NCYC 523, NRRL Y-8283, UCD 57-17
K. marxianus	64884	NRRL Y-1174
K. marxianus var. *bulgaricus*	16045 (T)	ATCC 56494, CBS 2762, NCYC 970, UCD 71-13
K. marxianus var. *dobzhanskii*	24175 (T)	CBS 2104, NCYC 538
K. marxianus var. *drosophilarum*	56496 (T)	CBS 2105, NRRL Y-8278
K. marxianus var. *lactis*	56498 (T)	UCD 71-59, CBS 683, IFO 1090, NCYC 416, NRRL Y-8279
K. marxianus var. *marxianus*	46537 (T)[1]	CBS 397, UCD 71-58, ATCC 56497
K. marxianus var. *vanudenii*	24207 (T)	CBS 4372
K. marxianus var. *wikenii*	22296 (T)	CBS 5671, ATCC 56501, NRRL Y-8287, UCD 71-15

[1] Type culture of *K. fragilis*.

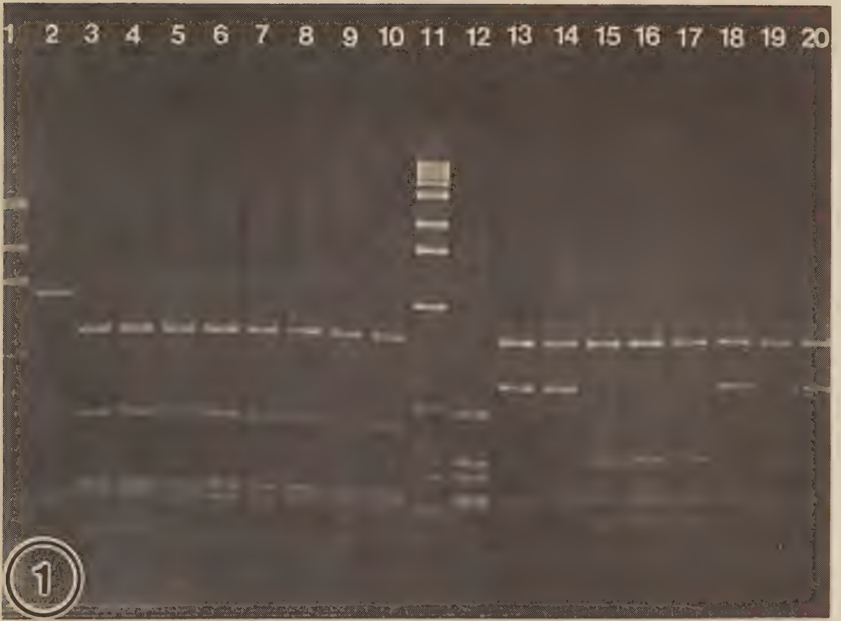
Riboprinting. The target DNA was diluted to a concentration of 1-50 ng/μL and then employed as template for PCR. Universal primers which are known to flank the 5' and 3' ends of the small subunit ribosomal RNA gene in eukaryotes (Medlin et al. 1988) were used to amplify the entire gene sequence. The primers were:

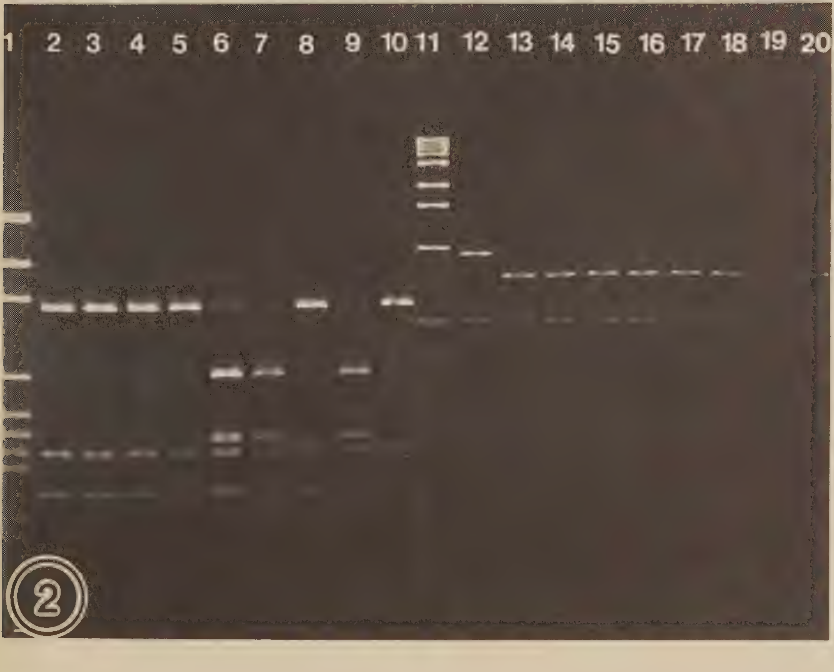
A: 5'-AACCTGGTTGATCCTGCCAGT
B: 3'-CATCCACTTGGACGTCTTCCTAGT.

PCR was performed with a GeneAmp Kit (Perkin-Elmer Cetus) and a PTC-100 thermal cycler (MJ Research) programmed for 30 cycles of 94C for 1 min, 55C for 1.5 min and 72C for 2 min. Each PCR product was purified using a Gene Clean kit (Bio 101) and resuspended in 100 μL of distilled water prior to digestion with 11 different restriction enzymes. The enzymes were: *Bst*UI, *Dde*I, *Hae*III, *Hha*I, *Hinf*I, *Msp*I, *Nla*I, *Rsa*I, *Sau*3AI, *Scrf*I, and *Taqα*I. Restriction fragments were electrophoresed on 2.6% NuSieve 3:1 agarose (FMC Bioproducts) in 0.5X Tris-borate buffer with PGEM and *Eco*RI/HindIII λ markers (Promega). Estimates of nucleotide substitutions per site (D values) were made by pair-wise comparisons of shared and unique fragments and using the formulas described by Nei and Tajima (1983). Data analysis was performed with the NTSYS-pc program (Exeter Publishing). Strains were clustered with the SAHN feature of the program and a phenogram was constructed by the UPGMA method (Nei 1987). The goodness of fit of the clustering to the data set was tested by generating a cophenetic value matrix (Rohlf and Sokal 1981) and using the MXCOMP program to compare this matrix to the original (input) matrix.

Figures 1-2. Comparison of SSU rDNA restriction digests: *K. polysporus* vs. *K. marxianus* varieties. The endonucleases generally give a characteristic pattern for *K. polysporus* (Fig. 1, lanes 2 & 12; Fig. 2, lane 12). *Hinf*I discriminates between the *K. marxianus* and the *K. lactis* clusters (Fig. 2, lanes 13-20). Three members of the *K. lactis* cluster can also be distinguished from the other strains on the basis of their *Msp*I restriction patterns (Fig. 2, lanes 6, 7 & 9). Figure 1: *Hha*I (lanes 2-10) and *Hinf*I (lanes 12-20) digests. Figure 2: *Msp*I (lanes 2-10) and *Rsa*I (lanes 12-20) digests.

1 - PGEM marker
2 - *K. polysporus*
3 - *K. marxianus*
4 - *K. marxianus* var. *bulgaricus*
5 - *K. marxianus* var. *drosophilarum*
6 - *K. marxianus* var. *dobzhanskii*
7 - *K. marxianus* var. *lactis*
8 - *K. marxianus* var. *marxianus*
9 - *K. marxianus* var. *vanudenii*
10 - *K. marxianus* var. *wikenii*
11 - *Eco*RI/*Bam*HI λ marker
12 - *K. polysporus*
13 - *K. marxianus*
14 - *K. marxianus* var. *bulgaricus*
15 - *K. marxianus* var. *drosophilarum*
16 - *K. marxianus* var. *dobzhanskii*
17 - *K. marxianus* var. *lactis*
18 - *K. marxianus* var. *marxianus*
19 - *K. marxianus* var. *vanudenii*
20 - *K. marxianus* var. *wikenii*


1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
1


1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
2

Assumptions. Riboprinting assumes that: 1) the small subunit ribosomal genes from different strains are orthologous, 2) co-migrating fragments are identical, and 3) rates of substitution between nucleotides are the same.

RESULTS

The small subunit ribosomal RNA gene was successfully amplified in all of the *Kluyveromyces* strains, with a yield of approximately 800 ng per reaction mixture. The molecular weight of the PCR products as estimated by comparison with *Eco*RI/*Hind*III lambda marker was 1.8 kilobase pairs. Co-migration of amplified rDNA from all strains indicated a similar molecular weight.

Four SSU rDNA restriction digests are shown in Figures 1 and 2. Except for MspI, most of the enzymes could discriminate between *K. polysporus* and all the other strains. *Hha*I and *Rsa*I, while not able to distinguish between the varieties of *K. marxianus*, still gave a distinctive pattern for the type species. Two types of restriction patterns could be distinguished amongst the *K. marxianus* strains using either *Hinf*I or *Msp*I.

Genetic distances between all possible pairs of strains were arrayed in a matrix (Fig. 3) and used as input for NTSYS-pc. D values ranging from 0 to 0.0411 were obtained and are well within the accuracy limits given for this method (Nei and Tajima 1983). The type species of the genus *Kluyveromyces*, *K. polysporus*, was separated from *K. marxianus* by a minimum distance of 0.0411, representing a 4.1% sequence divergence in the SSU rDNA. *K. marxianus* var. *marxianus* and *K. marxianus* var. *wikenii* showed identical restriction patterns for all 11 enzymes.

The strains of *K. marxianus* grouped into two major clusters which were well separated from *K. polysporus* (Fig. 4). The two groups were: **1 - *K. marxianus* cluster:** *K. marxianus*, *K. marxianus* var. *bulgaricus*, *K. marxianus* var. *marxianus* and *K. marxianus* var. *wikenii* and **2 - *K. lactis* cluster:** *K. marxianus* var. *dobzhanskii*, *K. marxianus* var. *drosophilarum*, *K. marxianus* var. *lactis* and *K. marxianus* var. *vanudenii*. There were various degrees of clustering within each major group. In Group 1 *K. marxianus* var. *marxianus* and *K. marxianus* var. *wikenii* had a zero D value. *K. marxianus* var. *drosophilarum* and *K. marxianus* var. *lactis* formed a closely related group with *K. marxianus* var. *vanudenii* in Group 2.

A cophenetic correlation coefficient (r) of 0.98 was obtained, indicating a very good fit for the cluster analysis (Rohlf 1988).

	Kpol	**KM**	**KMbul**	**KMdob**	**KMdro**	**KMlac**	**KMmar**	**KMvan**	**KMwik**
Kpol	0								
KM	0.0411	0							
KMbul	0.0389	0.0035	0						
KMdob	0.0352	0.0106	0.0070	0					
KMdro	0.0389	0.0183	0.0141	0.0055	0				
KMlac	0.0401	0.0168	0.0127	0.0040	0.0015	0			
KMmar	0.0357	0.0055	0.0040	0.0090	0.0106	0.0168	0		
KMvan	0.0401	0.0168	0.0127	0.0040	0.0055	0.0015	0.0106	0	
KMwik	0.0357	0.0055	0.0040	0.0090	0.0106	0.0168	0	0.0116	0

Kpol = *Kluyveromyces polysporus*
KM = *K. marxianus*
KMbul = *K. marxianus* var. *bulgaricus*
KMdob = *K. marxianus* var. *dobzhanskii*
KMdro = *K. marxianus* var. *drosophilarum*
KMlac = *K. marxianus* var. *lactis*
KMmar = *K. marxianus* var. *marxianus*
KMvan = *K. marxianus* var. *vanudenii*
KMwik = *K. marxianus* var. *wikenii*

Fig. 3. Distance matrix: *K. polysporus* and *K. marxianus* varieties. Genetic distance (D) was determined by estimating the number of nucleotide substitutions per polymorphic site on the SSU rDNA. Percentage of nucleotide substitutions between any two strains = D x 100%.

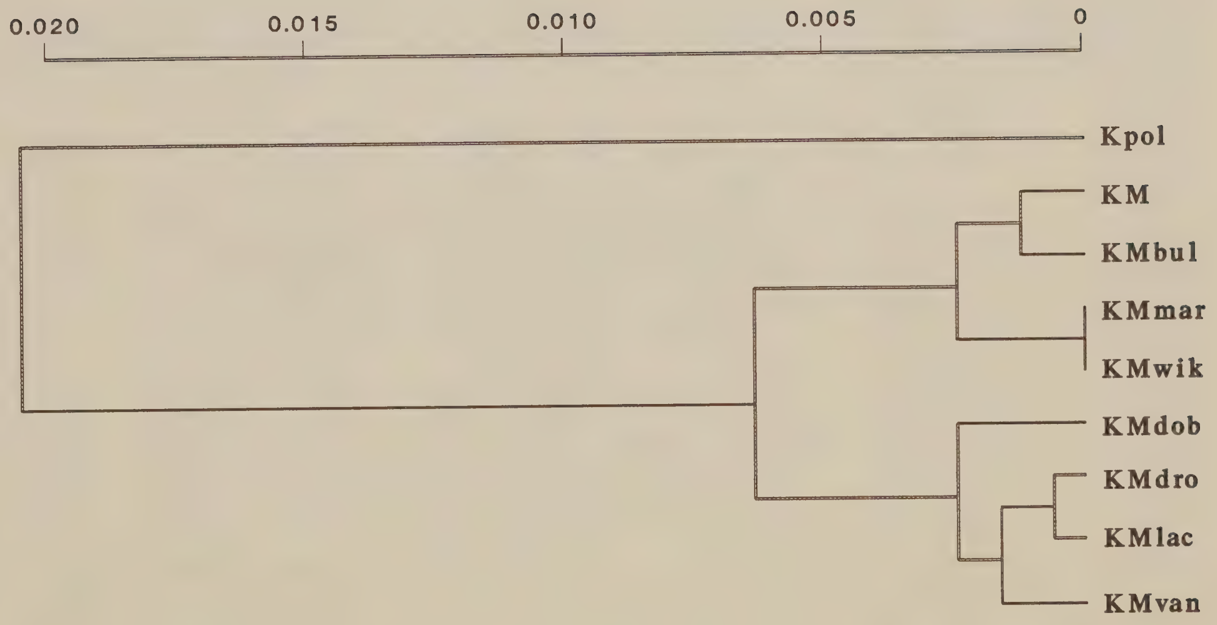


Fig. 4. Phenogram generated from cluster analysis of the distance matrix in Fig. 3. *K. marxianus* varieties group into two major clusters.

DISCUSSION

The relegation of nine species of *Kluyveromyces* to seven varieties of *K. marxianus* (Van der Walt and Johannsen 1984) was based on strain interfertility studies (Johannsen 1980). According to Fuson and co-workers (1987), the formation of hybrids in induced laboratory matings may have little ecological relevance. Strains that are interfertile (Johannsen 1980) may actually have different isoenzyme patterns and exhibit very low DNA base sequence similarity (Sidenberg and Lachance 1986, Fuson et al. 1987). That the ability to mate cannot be taken as a sole measure of conspecificity was further demonstrated by the group of Vaughan Martini (Vaughan Martini et al. 1987), who examined the physiological profile, isoenzyme pattern, DNA reassociation, and rDNA restriction maps of the hybrid between *K. marxianus* and *K. thermotolerans*. Therefore, other strain characteristics must be considered as determinants of the degree of genetic relatedness.

We have used riboprinting to determine restriction fragment length polymorphisms in varieties of *K. marxianus* and the type species, *K. polysporus*. The typical frequency of cutting of SSU rDNA for each enzyme is 4; this number, multiplied by the number of bases in the recognition sequence (4) and the total number of enzymes (11), yields 176. Thus, about 10% of the entire gene sequence is indirectly determined using this technique. Compared to the series of tests involving utilization or fermentation of various substrates, riboprinting can be completed in as little as five days. The amount of variation observed using 11 restriction enzymes was sufficient to enable us not only to distinguish between *K. marxianus* and *K. polysporus* but also to show that the former was a heterogeneous group consisting of two major clusters.

Previous studies on informational macromolecules have yielded groupings that are very similar to the ones obtained through riboprinting. The first major cluster, which we call the ***K. marxianus* group**, consisted of *K. marxianus* var. *marxianus*, *K. marxianus* var. *wikenii*, *K. marxianus* var. *bulgaricus* and a strain of *K. marxianus* that has not been assigned to any variety. *Hinf*I separates members of this group from the *K. lactis* cluster and thus can be considered a diagnostic endonuclease. Organisms in the *K. lactis* cluster have been found to constitute a cohesive electrophoretic group and to exhibit a high degree of DNA relatedness (Sidenberg and Lachance 1983, 1986; Fiol and Poncet 1980, Fuson et al. 1987, Vaughan Martini and Martini 1987). *K. marxianus* var. *marxianus* and *K. marxianus* var. *wikenii* had identical restriction patterns for all enzymes, suggesting that they are convarietal. However, it is not possible to correlate the results of riboprinting with genomic DNA homology as DNA reannealing data for these two varieties are not available.

The occurrence of *K. marxianus* var. *lactis*, *K. marxianus* var. *vanudenii* and *K. marxianus* var. *drosophilarum* in the ***K. lactis* group** is consistent with previously reported isoenzyme data. Sidenberg and Lachance (1986) found that electrophoretic patterns of the first two varieties were indistinguishable and that the third could not be differentiated unequivocally. The DNA base composition (38.5-42.6 mol% G+C) and sequence relatedness (64-98% complementarity) of these varieties are further evidence of their relationship (Fuson et al. 1987). Vaughan Martini and Martini (1987) likewise found a ≥85% DNA homology between *K. marxianus* var. *lactis* and the other two varieties using a spectrophotometric technique.

It is possible to draw a consensus grouping based on our riboprinting results and the foregoing studies on informational macromolecules. The overwhelming evidence suggest that the *K. marxianus* and *K. lactis* groups are distinct populations. We therefore concur with previous authors (Sidenberg and Lachance 1986, Vaughan Martini and Martini 1987, Fuson et al. 1987) that *K. lactis* should be reinstated as a separate species to include *K. marxianus* var. *lactis*, *K. marxianus* var. *drosophilarum*, and *K. marxianus* var. *vanudenii*.

The clustering of *K. marxianus var. dobzhanskii* with the *K. lactis* group is inconsistent with previously reported data on isoenzyme electrophoresis and DNA homology. Its isoenzyme pattern has been considered to be sufficiently different from that of the other members of the group (Sidenberg and Lachance 1986). Moreover, there is a low level of DNA complementarity between *K. marxianus* var. *dobzhanskii* and the other members of the *K. lactis* cluster (Fuson et al. 1987). In their most recent treatise on the yeasts, Barnett and co-workers (1990) consider *K. dobzhanskii* as a distinct species. Riboprinting provides no evidence in support of this treatment.

While interfertility is usually a good indicator of conspecificity, results of forced mating studies conducted in the laboratory must be interpreted with caution. The studies cited above have shown that strain hybridization does not necessarily indicate gene flow. We believe that a constellation of characters has to be considered for a more accurate determination of taxonomic affinities.

The estimates of infraspecific genetic distances in *K. marxianus* are limited to the strains included in this study. The extent of variability in rDNA restriction patterns between strains of the same species remains to be determined. Subsequent work on *Kluyveromyces* species will have to include multiple strains, preferably from different geographical locations and substrates, in order to assess any interstrain variability.

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LITERATURE CITED

Barnett, J.A., R.W. Payne, and D. Yarrow. 1990. Yeasts: Characteristics and identification. Cambridge: Cambridge University Press. 1002 p.

Bicknell, J.N. and H.C. Douglas. 1970. Nucleic acid homologies among species of *Saccharomyces*. *J. Bacteriol.* **101**: 505-512.

Clark, C.G. and L.S. Diamond. 1991. The Laredo strain and other '*Entamoeba histolytica*-like amoebae are *Entamoeba moshkovskii*. *Mol. Biochem. Parasitol.* **46**: 11-18.

Fiol, J.B. 1967. Intérêt systématique des tests de croissance en milieu déficient en vitamines pour le genre *Kluyveromyces* (v. der Walt) et *Pichia* (Hansen). *Rev. Mycol.* **32**: 45-55.

Förster, H., M.D. Coffey, H. Elwood, and M.L. Sogin. 1990. Sequence analysis of the small subunit ribosomal RNAs of three zoosporic fungi and implications for fungal evolution. *Mycologia* **82**: 306-312.

Fuson, G.B., H.L. Presley, and H.J. Phaff. 1987. Deoxyribonucleic acid base sequence relatedness among members of the yeast genus *Kluyveromyces*. *Int. J. Syst. Bacteriol.* **37**: 371-379.

Johannsen, E. 1980. Hybridization studies within the genus *Kluyveromyces* van der Walt emend. van der Walt. *Antonie van Leeuwenhoek* **46**: 177-189.

Johannsen, E. and J.-P. van der Walt. 1978. Interfertility as a basis for the delimitation of *Kluyveromyces marxianus*. *Arch. Microbiol.* **118**: 45-48.

Lachance, M.-A. and H.J. Phaff. 1979. Comparative study of molecular size and structure of exo-ß-glucanases from *Kluyveromyces* and other yeast genera: Evolutionary and taxonomic implications. *Int. J. Syst. Bacteriol.* **29**: 70-78.

Medlin, L., H.J. Elwood, S. Stickel, and M.L. Sogin. 1988. The characterization of enzymatically amplified eukaryotic 16S-like rRNA coding regions. *Gene* **71**: 491-499.

Nei, M. 1987. Molecular Evolutionary Genetics. New York: Columbia University Press. 448 p.

Nei, M. and F. Tajima. 1983. Maximum likelihood estimation of the number of nucleotide substitutions from restriction sites data. *Genetics* **105**: 207-217.

Rohlf, F.J. and R.R. Sokal. 1981. Comparing numerical taxonomic studies. *Systematic Zool.* **17**: 407-412.

Rohlf, F.J. 1988. NTSYS-pc: Numerical Taxonomy and Multivariate Analysis System. New York: Exeter Publishing, Ltd.

Sidenberg, D.G. and M.-A. Lachance. 1983. Speciation, species delineation, and electrophoretic isoenzyme patterns of the type strains of *Kluyveromyces* van der Walt emend. van der Walt. *Int. J. Syst. Bacteriol.* **33:** 822-828.

Sidenberg, D.G. and M.-A. Lachance. 1986. Electrophoretic isoenzyme variation in *Kluyveromyces* populations and revision of *Kluyveromyces marxianus* (Hansen) van der Walt. *Int. J. Syst. Bacteriol.* **36**: 94-102.

Sogin, M.L. and J.H. Gunderson. 1987. Structural diversity of eukaryotic small subunit ribosomal RNAs: Evolutionary implications. *Ann. New York Acad. Sci.* **503**: 125-139.

Van der Walt, J.-P. 1965. The emendation of the genus *Kluyveromyces* v. d. Walt. *Antonie van Leeuwenhoek J. Microbiol. Serol.* **31**: 341-348.

Van der Walt, J.-P. 1970. The genus *Kluyveromyces* van der Walt emend. van der Walt, p. 316-378. *In* J. Lodder (ed.), The Yeasts, 2nd ed. Amsterdam: North-Holland Publ. Co.

Van der Walt, J.-P. and E. Johannsen. 1984. *Kluyveromyces* van der Walt emend. van der Walt, p. 224-251. *In* N.J.W. Kreger-van Rij (ed.), *The yeasts: A taxonomic study,* 3rd ed. Amsterdam: Elsevier Science Publishers, B.V.

Vaughan Martini, A. and A. Martini. 1987. Taxonomic revision of the yeast genus *Kluyveromyces* by nuclear deoxyribonucleic acid reassociation. *Int. J. Syst. Bacteriol.* **37**: 380-385.

Vaughan Martini, A., D.G. Sidenberg, and M.-A. Lachance. 1987. Analysis of a hybrid between *Kluyveromyces marxianus* and *Kluyveromyces thermotolerans* by physiological profile comparison, isoenzyme electrophoresis, DNA reassociation, and restriction mapping of ribosomal DNA. *Can. J. Microbiol.* **33**: 971-978.

MYCOTAXON

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TULOSTOMA SQUAMOSUM, *T. VERRUCOSUM* AND *T. MUSSOORIENSE* ARE THE SAME SPECIES

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Abstract: The type of *Tulostoma verrucosum* Morgan and materials of *T. mussooriense* P. Hennings collected in Pakistan by Ahmad have been studied and they proved to be identical both macro- and microscopically with *T. squamosum* Gmelin:Pers., a species frequent in chalky soils in Europe. Both Light and S.E.M. photomicrographs are included.

Key words: *Tulostoma squamosum*, *T. verrucosum*, *T. mussooriense*, *Gasteromycetes*, taxonomy.

We are currently studying the species of the genus *Tulostoma* from the Mediterranean basin, comparing them with American taxa. It thus seems that in the Iberican Peninsula more and more taxa are involved, some of them having been described from America and so far unknown to Spain or even to Europe, such as *T. cyclophorum* Lloyd (MORENO, ALTÉS & AYALA, 1991), *T. lloydii* Bresad. (MORENO, HONRUBIA, CALONGE & WRIGHT, 1984), *T. macrocephalum* Long (CALONGE & WRIGHT, 1989; ALTÉS, MORENO & WRIGHT, 1991), and also the new species *T. pseudopulchellum* (MORENO, ALTÉS & WRIGHT, 1991).

In this paper we have compared American specimens of *T. verrucosum*, including the holotype, and material of *T. mussooriense* from India, with *T. squamosum* from several Spanish areas.

MATERIAL AND METHODS

Most of the studied material of *T. squamosum* has been deposited at the Herbarium of the Plant Biology Dept. (Botany) of Alcalá de Henares University, Spain (AH); only the specimen from Roumania is located at the Herbarium of the Dept. of Biological Sciences, University of Buenos Aires (BAFC). On the other hand, collections of *T. verrucosum* were sent from the National Fungus Collections (BPI), Beltsville, U.S.A., except the type which belongs to the Herbarium of the Botanical Dept., Naturhistoriska Riksmuseet, Stockholm, Sweden (S). The sample of *T. mussooriense* studied is a duplicate of Dr. Sultan Ahmad´s herbarium (Pakistan) extant at BAFC.

The methods used in this study are those indicated by MORENO, ALTÉS, OCHOA, AYALA & WRIGHT (1991).

Tulostoma squamosum Gmelin:Pers., *Synopsis Fung.*:139 (1801).
Figs.1c-1f;1h;2a-2c;3-13;19

Material studied: EUROPE: Spain: Calar del Mundo, Albacete, in cracks of rocks, *leg.* G.López, 9-III-1980, AH 1678 (duplo Honrubia's Herb. 3075); Cañón del rio Lobos, Soria, among bryophites in basic soil with *Juniperus sp.*, *leg.* J.Mª Barrasa, 2-V-1981, AH 1764; Priego de Córdoba, Córdoba, in basic Quercetum, *leg.*J.Gómez, IV-1988, AH 11600; *ibid.*, AH 11601; Madrid, in urban plot, *leg.* F.J.Martínez, autumn-1988, AH 11656; Fuente la Reina, Castellón, in thyme shrub, *leg.* A.Burguete, IV-1989, AH 12448; Sierra de la Gallinera, Carcabuey, Córdoba, in basic Quercetum, *leg.* J.Gómez, III-1990, AH 12961; La Nava, Priego, Córdoba, in basic Quercetum, *leg.* J.Gómez, 20-VI-1990, AH 12962; *ibid.*, II-1990, AH 12963; Sierra Espuña, Pliego, Murcia, in basic soil with *Juniperus sp.*, *leg.* M.Honrubia, 2-III-1980, AH 13280 (duplo Honrubia's Herb. 2999). Roumania: Muntenia, Prahova, Paulestia, *leg.* Savulescu & Alexandri, 10-IV-1931, BAFC 30347 (ex Herb.Mycol.Roman. 495).

We can add little to the detailed descriptions of this species, abundant in Europe and living always in basic (chalky) soils; we will, however, describe the exoperidium in detail. As it is already, the exoperidium of *T.squamosum* is of the membranous type, splitting and slowly sloughing off in small plates. A detailed observation of our collections shows that in this species there is a clear tendency towards fragmentation of the exoperidium into small verrucae or plates, of a more or less circular shape which, in many cases, leave a distinct scar or areola on the endoperidium upon falling off.

A microscopic study of the exoperidium shows that it is formed by characteristic sphaerocysts or chains of subglobose or shortly cylindric cells, besides other hyphal elements. These cells are present even in those specimens exhibiting a less distinct verrucose exoperidium. The capillitium is septate, slightly broadened at the septa. Spores are spiny, formed by elements united at the apex, very similar to those described by WRIGHT (1987) for *T.verrucosum* and *T.mussooriense*. Sometimes these are observed somewhat subreticulate (fig. $2c_2$), probably due to their not being entirely mature.

Tulostoma verrucosum Morgan, *Jour.Cincinnatti Soc.Nat.Hist.* 12:164, tab.16, fig.5 (1890).
Figs.1a-1b;1g;2d-2f;14-18

Material studied: NORTH AMERICA: United States: Morgan's Herb. 1237 (S) -type-; Ohio, *leg.* A.P.Morgan, Ellis's Herb. (BPI); Missouri, *leg.* E.A.Burt, X-1913, MO 2956 (BPI); Falling Springs, Illinois, on sandy ground in dry slope, *leg.* L.O.Overholts & D.T.Mallory, 3-XI-1926, MO 63794 (BPI); Ohio, 1883, Morgan's Herb. 358 (BPI). SOUTH AMERICA: Brasil: Sao Leopoldo, 1908, Rick's Herb. 277 (BPI); Nova Petropolis, 1924, Rick's Herb. 374 (BPI).

Its features fit those described by WRIGHT (1987). The verrucose exoperidium is more or less distinct and leaves characteristic scars or areolae on the endoperidium upon falling off, very similar to those previously described in the Spanish collections of *T.squamosum*. It presents subglobose cells or sphaerocysts in the exoperidium. Other features, such as the prominent tubular mouth, the stem covered by brown squarrose scales, the septate capillitium hardly broadened at septa and the spores with a typical ornamentation under S.E.M., formed by conical to pyramidal spines formed by several columns united at their apices, are shared by both taxa.

The fact that these two taxa are so macro- and microscopically similar, has led us to conclude that they constitute a single taxon, whereby the epithet *T. squamosum* has priority. This synonymy had already been annotated by C.G.Lloyd on the type label.

Tulostoma mussooriense P.Hennings, *Hedwigia* 40:337 (1901).

Fig. 20

Material studied: ASIA: Pakistan: Murree Hills, Charehan, 15-VIII-1953, Ahmad's Herb. (BAFC).

The type description of this species at S, as indicated by WRIGHT (1987), coincides with that of *T. squamosum* and *T. verrucosum*. Upon studying the exoperidium of Pakistani material we have verified that it is also formed by sphaerocysts similar to those of the later species. Futhermore, the spores under S.E.M. are identical to those of *T. squamosum*.

ACKNOWLEDGEMENTS

We wish to express our gratitude to the Ministerio de Educación y Ciencia (M.E.C.) for granting a P.F.P.I. fellowship to one of us (A.Altés) to undertake his doctoral thesis. To the Secretaría General Técnica, Subdirección General de Cooperación Internacional (M.E.C.) for granting the senior author a Project of Joint Research for comparing fungi from America and Europe.

Dr.Wright wishes to extend his thanks to the University of Alcalá de Henares for an appointment of Visiting Professor and to the National Research Council of Argentina (CONICET) for a travel grant to Spain.

Thanks are due to Dr.A.Strid (S) for the loan of the type of *T.verrucosum*, and Dr.A.Y.Rossman (BPI) for the loan of several collections of this taxon. We are also indebted to many friends and collaborators throughout Spain who have sent their interesting collections, particularly Mr.J.Gómez of Priego, Córdoba. Mr.A.Priego has provided his invaluable skill with the S.E.M.

LITERATURE

Altés,A., G.Moreno & J.E.Wright (1991). *Tulostoma macrocephalum* Long, una especie americana presente en el litoral mediterráneo español. *Cryptogamie-Mycologie* (in press).

Calonge,F.D. & J.E.Wright (1989). El género *Tulostoma* Pers.:Pers. (*Gasteromycetes*) en España. *Bol.Soc.Micol.Madrid* 13:119-137.

Moreno,G., A.Altés & N.Ayala (1991). *Tulostoma cyclophorum* Lloyd (*Gasteromycetes, Basidiomycotina*) nuevo para España peninsular. *Anales Inst.Biol.Univ.Nac.Auton. México ,Ser.Bot.* 60(1):21-25 (special vol. to pay homage to Dr.Teófilo Herrera).

Moreno,G., A.Altés, C.Ochoa, N.Ayala & J.E.Wright (1991). The genus *Tulostoma* in Baja California, Mexico. *Mycologia* (in press).

Moreno,G., A.Altés & J.E.Wright (1991). *Tulostoma pseudopulchellum sp.nov.* (*Tulostomatales, Gasteromycetes*) and allied species. *Mycotaxon* (in press).

Moreno,G., M.Honrubia, F.D.Calonge & J.E.Wright (1984). Aportación al conocimiento de los hongos del S.E. de España. V. *Tulostomatales* (*Gasteromycetes*). *Bol.Soc.Micol. Castellana* 8:93-106.

Wright,J.E. (1987). *The genus Tulostoma (Gasteromycetes). A world monograph.* Biblioth. Mycol. 113. J.Cramer. 338 pp.

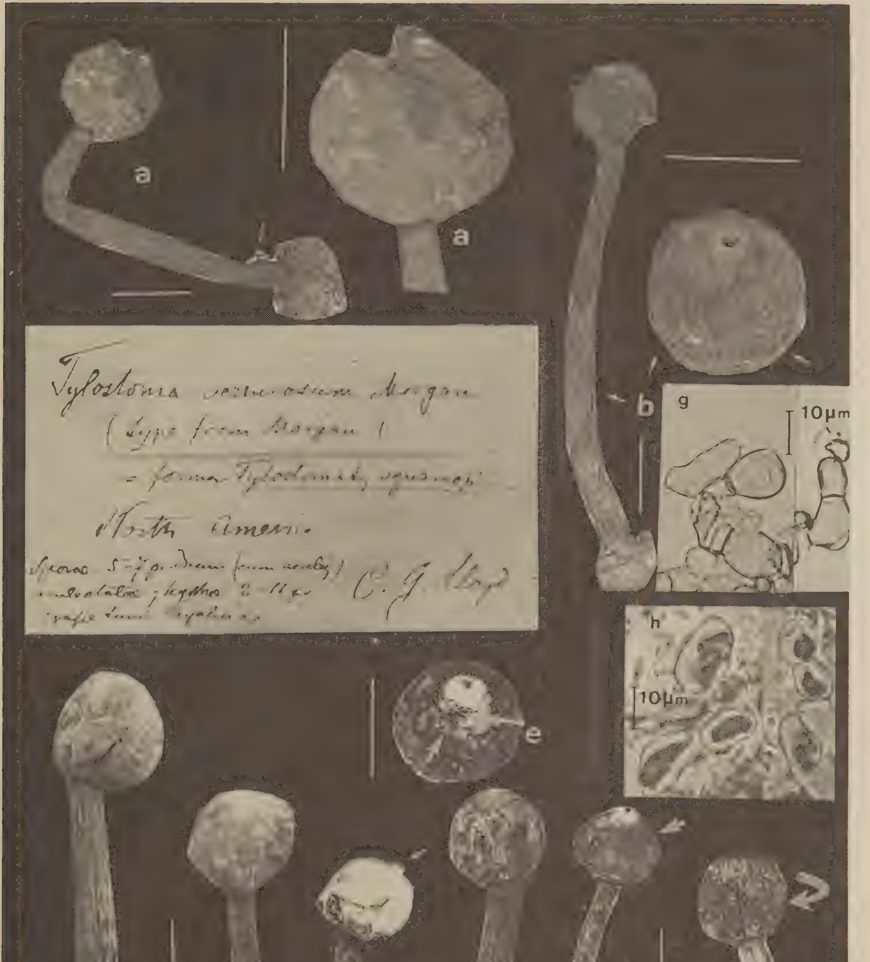
CAPTIONS OF PHOTOGRAPHS

Fig.1. Fruit-bodies of: a. *T.verrucosum* Herb.Morgan 1237 (S) -type-; b. *ibid.* Morgan's Herb. 358 (BPI); c. *T.squamosum* AH 11601; d. *ibid.* AH 11600; e. *ibid.* AH 12962; f. *ibid.* AH 13280 (duplo Honrubia's Herb. 2999). Bars=1cm.
Sphaerocysts of the exoperidium: g. *T.verrucosum* Morgan's Herb. 1237 (S) -type-; h. *T.squamosum* AH 12961.

Fig.2. Spores: a. *T.squamosum* AH 11601; b. *ibid.* AH 11600; c. *ibid.* AH 12448; d. *T.verrucosum* Lloyd's Herb. 1237 (S) -type-; e. *ibid.* Ellis's Herb. (BPI); f. *ibid.* Morgan's Herb. 358 (BPI). Bars=1µm.

Figs.3-19. Capillitium, capillitial septa and spores: 3-5. *T.squamosum* AH 11600; 6-8. *ibid.* AH 13280 (duplo Honrubia's Herb. 2999); 9-11. *ibid.* AH 12448; 12-13,19. *ibid.* AH 11656; 14-18. *T.verrucosum* Lloyd's Herb. 1237 (S) -type-.

Fig.20. *Tulostoma mussooriense* Ahmad's Herb. (BAFC): a. fruit-bodies; b. details of the spore sac (bar=1cm); c. sphaerocysts from the exoperidium; d. spores (bar=1µm); e. capillitium.


a
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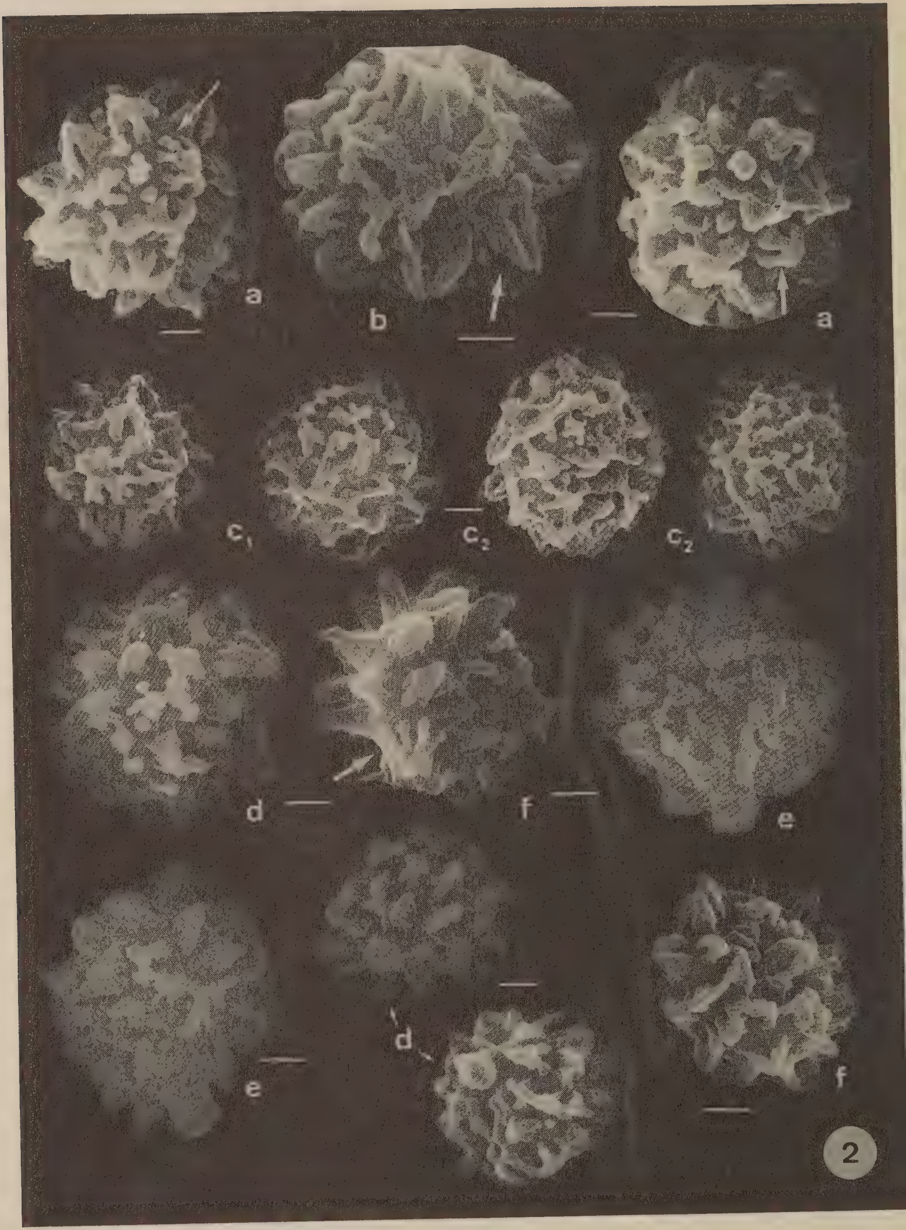
Tylostoma verrucosum Morgan
(type from Morgan)
= forma Tylostomatis squamosi
North America
[illegible]
C. G. Lloyd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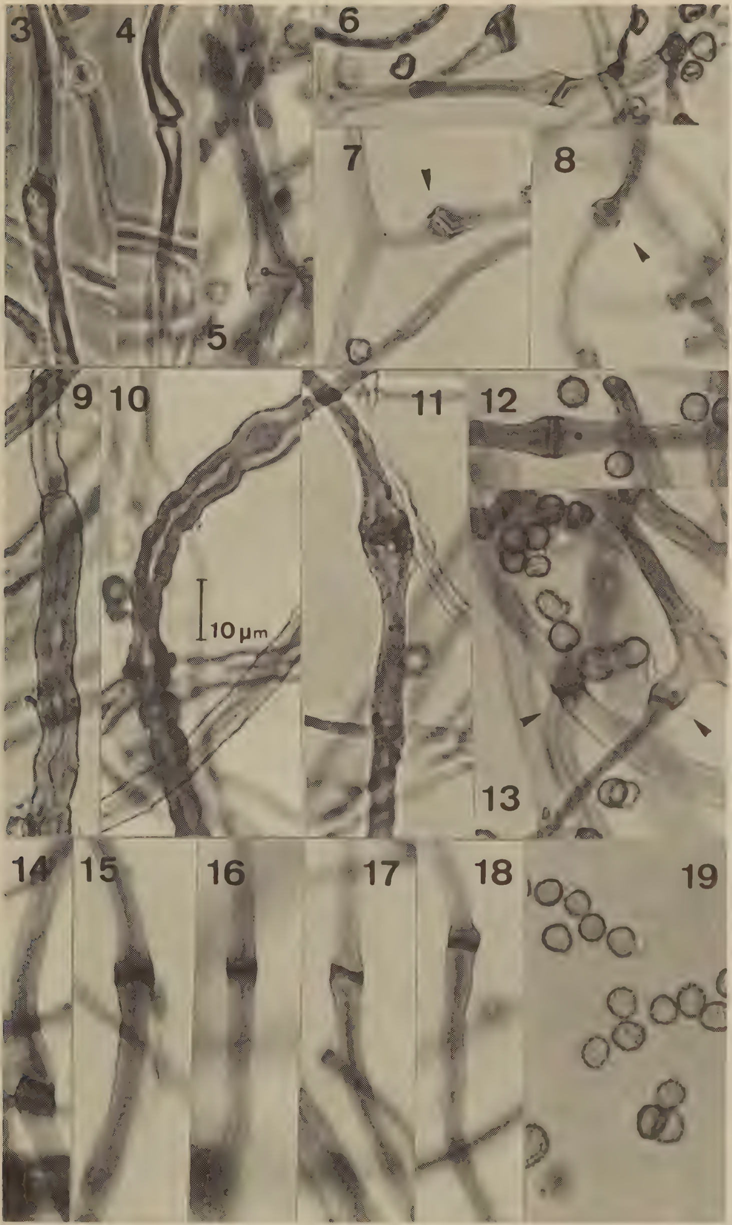
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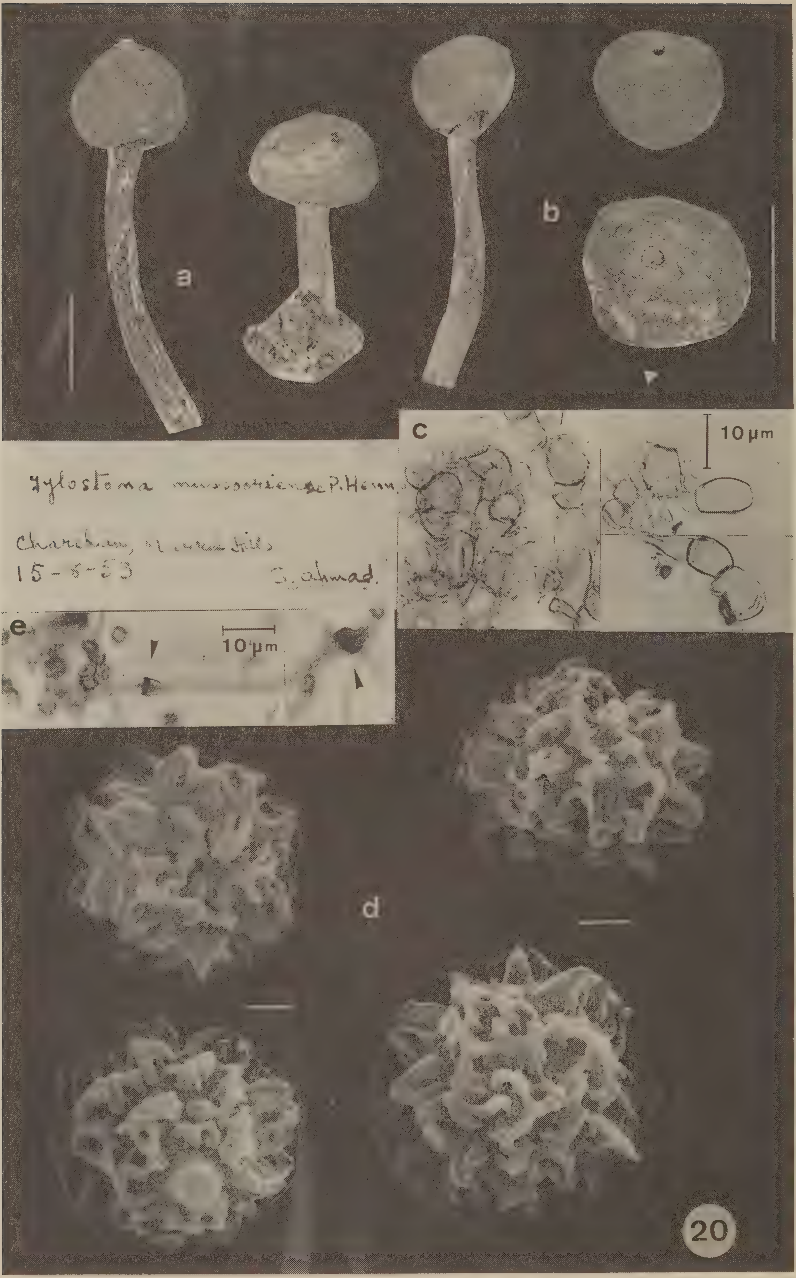

Tylostoma mussooriense P.Henn.

Charchan, [illegible] hills
15-5-53 S. ahmad.

a
b
c
10 µm
e
10 µm
d
20

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A NEW SPECIES OF GENUS DISCOSIA

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ABSTRACT

Discosia tillandsiae - a new species of genus *Discosia* Lib., parasiting on leaves of *Tillandsia* sp. in Mexico, is described and illustrated.

During a taxonomic revision of genus *Discosia* Lib. (*Coelomycetes*), a herbarium specimen labelled "*Discosia* sp.", received from the National Fungus Collection, Beltsville, Maryland, U.S.A. (BPI), was examined. The fungus is a typical *Discosia*, parasiting on leaves of *Tillandsia* sp. (*Bromeliaceae*). In the present note the new species is described and illustrated.

DISCOSIA TIILANDSIAE Vanev, sp. nov. (Fig. 1).

Maculae 0.8-1.5 cm in diam., orbiculares vel angulatae, solitariae, albido-griseae, atro-purpureo-marginatae. Pycnidia 120-250 µm in diam., solitaria, sparsa, rotundata, globoso-complanata vel discoidea, nigra; ostiolo rotundo, 15-25 µm in diam. Cellulae conidiogenae 5-12 X 2.5-3 µm, holoblasticae, cylindricae vel conicae, hyalinae. Conidia 16.5-20 (M=18±0.17) X 3.3-3.8 (M=3.4±0.02) µm, fusiformia vel cylindracea, utrinque angustata, apice rotundata, basi truncata, recta vel leniter curvata, dorsiventralia, 3-septata, semper longior cellula media, vicina basis, quam cellula media, vicina apices; appendices proxime duo septa extrema formantur. Conidia hyalina vel cellulae mediae flavo-viridae.

Habitatio. In foliis vivis Tillandsiae sp., Mexico, Chiapas, 13.06.1977, M. van Valkenburg, BPI, holotypus.

In speciebus e familia Bromeliaceae Discosia primum observatur.

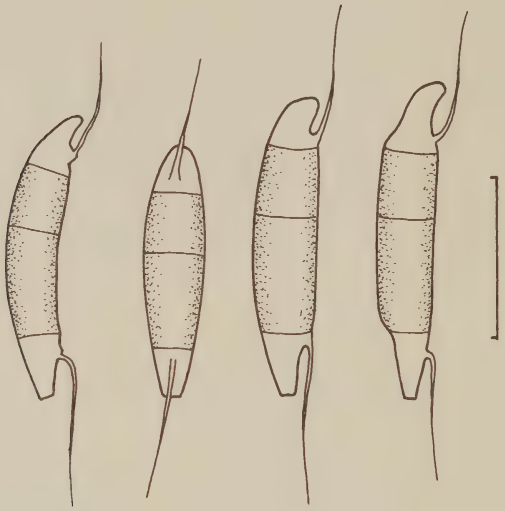

Fig. 1. Conidia of Discosia tillandsiae.
Scale bar = 10 µm.

Leaf spots 0.8-1.5 cm in diam., circular or irregular, single, grey-whitish, surrounded by a purple-brown ring. Conidiomata pycnidial, ostiolate, 120-250 µm in diam., more or less circular in outline, depressed-globose or discoid, disperse, separate, subcuticular or subepidermal, black; ostioles 15-25 µm in diam., central, circular, papilate. Conidiogenous cells 5-12 X 2.5-3 µm, holoblastic, cylindrical, conical or flask-shaped, straight or slightly curved, hyaline. Conidia 16.5-20 (M=18±0.17) X 3.3-3.8 (M=3.4±0.02) µm, fusoidal or cylindrical, slightly tapered to the both ends, with a truncate base and an obtuse apex, dorsiventrally curved, smooth, typically 3-euseptate, the two middle cells yellow-greenish, unequ-

al in length: the middle cell adjacent to the base always longer than the other middle cell adjacent to the apex; the two end cells hyaline. Conidial appendages subapical and suprabasal, hair-like, single, arising just to the two end-septa of the ventral side of the conidium.

D. tillandsiae is the only *Discosia* species parasiting on plants of the family *Bromeliaceae* known so far.

ACKNOWLEDGEMENTS

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LITERATURE CITED

Subramanian, C. V. & K. R. Chandra-Reddy. 1974. The genus *Discosia*. I. Taxonomy. Kavaka 2:57-89.

Sutton, B. C. 1980. The *Coelomycetes*. C. M. I. Kew, Surrey, England.

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NEW RAMULARIA SPECIES FROM RUMANIA

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ABSTRACT

Ramularia inae Vanev & Negrean, sp. nov., parasiting on leaves of Alkanna tinctoria (L.) Tausch. in Rumania, is described, illustrated and compared with the similar species R. alkannae Ossipian.

During the taxonomic studies of some undetermined Hyphomycetous specimens deposited in the Mycological Herbarium of the Institute of Biological Sciences, Bucharest, Rumania (BUCM), a new Ramularia species was established. In the present communication the new species is described, illustrated and compared with R. alkannae Ossipian.

RAMULARIA INAE Vanev & Negrean, sp. nov. (Fig. 1).

Maculae 3-8 mm in diam., amphigenae, diffusae, orbiculares vel angulatae, interdum nervis limitatae, saepe confluentes, brunneae. Caespituli amphigeni, dispersi, pruinam punctatam griseo-albam formantes. Conidiophora 12.5-38 X 2.5-3.5 µm, 1-3 cellularia, simplicia, recta vel irregulariter incurvata, apice denticulata, hyalina. Conidia 7.5-17.5 X 3.5-4.5 µm, ovata, ellipsoidea, cylindrica vel fusiformia, 1-2-cellularia, recta, hyalina, catenulata.

Habitatio: in foliis vivis Alkannae tinctoriae (L.)

Tausch., Romania, regio Dolj, Ciuperceni, Arceru, in arenosis, 27 Sept. 1979, leg. G. Negrean, BUCM holotypus, SOM isotypus.

Species nostra a Ramularia alkannae Ossipian conidiis minoribus differt (vide tabulam).

Table 1. Comparison between Ramularia inae and R. alkannae

	Conidia			
Species	Size (µm)	Structure	Septation	Colour
R. inae (holotype)	7.5-17.5 X 3.5-4.5	Ovoid, cylindric to fusiform	0-3	Colourless
R. alkannae (holotype)	23-58 X 4.5-7	Cylindric to obclavate	0-1	Greenish

Leaf spots 3-8 mm in diam., amphigenous, diffuse, circular or angular, vein limited, single or confluent, brown. Caespituli mostly amphigenous, disperse, not dense, grey-whitish. Conidiophores 12.5-38 X 2.5-3.5 µm, aggregate in fascicles, unbranched, 1-3-celled, straight or geniculate, with slightly prominent conidial scars in the apical zone. Conidia 7.5-17.5 X 3.5-4.5 µm, ovoid, ellipsoid, cylindric to fusiform, 1-2-celled, straight, hyaline, catenulate.

Ossipian (1975) described R. alkannae (as R. alcannae) on living leaves of Alkanna orientalis (L.) Boiss. R. inae clearly differs from R. alkannae in some morphological data - conidial size, structure, number of septa and colour (Table 1).

LITERATURE CITED

Ossipian, L. L. (1975). Mycoflora Armijanskoj SSR. Gifalnie griby. Erevan, U.S.S.R.

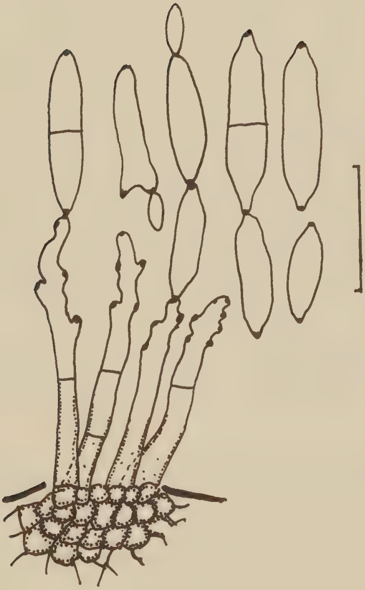

Fig. 1. Conidiophores and conidia of Ramularia inae. Scale bar = 10 µm.

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A LIST OF TYPE SPECIMENS OF NEW ZEALAND FUNGI HELD IN DSIR PLANT PROTECTION HERBARIUM (PDD)

E.H.C. McKENZIE, P.J. O'SULLIVAN, J.P. WILKIE

DSIR Plant Protection
Private Bag, Auckland, New Zealand

The herbarium of DSIR Plant Protection (PDD) was initiated about 1920 as the private collection of G.H. Cunningham, the first director of Plant Diseases Division, Department of Scientific and Industrial Research (DSIR). The collection was transferred to DSIR in 1936 when Plant Diseases Division was established. This Division and Entomology Division merged in 1989 to form DSIR Plant Protection. Herb. PDD is one of the few sizeable collections of fungi in the Southern Hemisphere. It is a primary source of information on the fungi of New Zealand and of the South Pacific. All major groups of fungi are represented, with emphasis on the plant parasitic microfungi and wood decay basidiomycetes. Indigenous fungi are also well represented. It is a voucher repository for plant disease records for New Zealand (Pennycook 1989), and for island nations of the South Pacific (e.g., Dingley et al. 1981, McKenzie & Jackson 1986, 1990a,b).

Of the approximately 60,000 specimens in PDD, about 6,000 come from Pacific States (American Samoa, Cook Islands, Fiji, Federated States of Micronesia, Kiribati, Marshall Islands, Niue, Palau, Solomon Islands, Tonga, Tuvalu, Vanuatu and Western Samoa), and 10,000 from other countries. Exchange programmes are maintained with herbaria in Australia, Canada, China and Germany. Major exsiccatae held include North American Fungi I and II, Reliquiae Petrakianae, and K. Vánky, Ustilaginales. Research interests of the current staff cover Agaricales (B.P. Segedin, research associate), Aphyllophorales (P.K. Buchanan - especially polypores), Ascomycetes (P.R. Johnston - especially discomycetes), Gasteromycetes (R.E. Beever), Uredinales and Hyphomycetes (E.H.C. McKenzie, curator).

The herbarium is the main repository for New Zealand collections made by G.H. Cunningham (Aphyllophorales, Gasteromycetes, Uredinales), J.M. Dingley (Ascomycetes), R.F.R. McNabb (Agaricales, Boletales, Dacrymycetaceae, Strobilomycetaceae, Tremellaceae) and G.J. Samuels (Ascomycetes), and for type specimens of New Zealand fungi described by visiting overseas mycologists, especially E. Horak (Agaricales), S.J. Hughes (Hyphomycetes, sooty moulds) and R.H. Petersen (Clavariaceae). Most New Zealand mycologists have deposited their type specimens in PDD, including type specimens for all New Zealand fungi described by G.H. Cunningham (1892-1962), J.M. Dingley, R.F.R. McNabb (1934-72) and G.J. Samuels. A notable exception is G. Stevenson (1911-90), whose many specimens (types and otherwise) of Agaricales were routinely sent to Kew.

The herbarium also has some of the fungal collections made by W. Colenso (1811-1899). These specimens, on long-term loan from the National Museum of New Zealand, Wellington, usually bear locality names, data which are missing from Colenso specimens held at Kew. Among the Colenso specimens are several putative types, and there may be others. Despite stating that he kept no regular herbarium (his herbarium was at Kew), Colenso retained duplicates of many of his fungal collections, and in 1949 this material was passed from the Hawkes Bay Museum to the Dominion (now National) Museum (Hamlin 1971, McKenzie 1983). Colenso's fungi were mostly identified, and any new species were described by M.C. Cooke at Kew. Some specimens are held on long-term loan from the Cawthron Institute, Nelson. These are only part of what must have been a much larger herbarium. All specimens belonging to Cawthron Institute were presumed lost until 1982 when approximately 400, including two type specimens, were located in the loft of an implement shed at the Institute. All fungal specimens, including seven types, from the herbarium of the Plant Health and Diagnostic Station, Levin (LEV) have been incorporated into PDD. Type specimens of four species of *Tremellodendropsis* described by Crawford (1954) were deposited in PDD in the 1980s. However, the location of *Tumidapexus ravus* Crawford, described in the same paper is not known. There are ten missing type specimens, of which two, *Erysiphe carpophila* H. Sydow and *E. carpophila* var. *rubicola* Murray (ex Cawthron Institute), and associated paratypes were lost in the mail. Fortunately, there is a modern description and illustration of both fungi (Braun 1987).

ARRANGEMENT OF THE LIST

The following list of fungal names of 1056 type specimens of New Zealand fungi held in PDD is arranged alphabetically by genus and species, together with details of publication. Page numbers refer to the Latin description and to collecting details for the type specimen; thus, they are sometimes presented as a page spread. Journal titles are abbreviated according to Brown & Stratton (1963). The host or substrate, and collection details, are cited more or less as originally published, with some standardisation. For the sake of brevity, author names have been omitted from the host plant names. The detail in square brackets is either additional information gleaned from the herbarium specimen, or is a correction or other information that conflicts with the published data. An asterisk (*) indicates that the specimen cannot be located in herb. PDD and is presumably lost. Unless otherwise stated, it is implicit that the PDD specimen is the holotype. Etymology is given for a few species, especially those named after a person, or those with a Maori language derivation where it is not obvious from the collection details. All fungal and plant names are given as originally published, and no attempt has been made to update the names by incorporating new taxonomic synonyms. However, to assist in tracking the basionym for later synonyms, an alphabetical listing of all species names is presented at the end. Where known, corresponding anamorph or teleomorph names are given. Abbreviations for herbaria follow Holmgren et al. (1981), and for culture collections follow Takishima et al. (1989).

References

Braun, U. 1987: A monograph of the Erysiphales (powdery mildews). *Beihefte zur Nova Hedwigia 89*: 1-700.

Brown, P.; Stratton, G.B. (eds.) 1963: World list of scientific periodicals published in the years 1900-1960. Butterworths, London. 3 vols.

Crawford, D.A. 1954: Studies on New Zealand Clavariaceae. 1. *Transactions of the Royal Society of New Zealand 82*: 617-631.

Dingley, J.M.; Fullerton, R.A.; McKenzie, E.H.C. 1981: Records of fungi, bacteria, algae, and angiosperms pathogenic on plants in Cook Islands, Fiji, Kiribati, Niue, Tonga, Tuvalu, and Western Samoa. Survey of agricultural pests and diseases, Technical Report 2. UNDP and FAO, Rome. 485pp.

Hamlin, B.G. 1971: The Bryophyte collections of William Colenso in the Dominion Museum, Wellington. *New Zealand Journal of Botany 9*: 695-698.

Holmgren, P.K.; Keuken, W.; Schofield, E.K. 1981: Index Herbariorum I. The herbaria of the world, 7th edition. *Regnum Vegetabile 106*: 1-452.

McKenzie, E.H.C. 1983: Mycological history and exploration in New Zealand. *Archives of Natural History 11*: 233-247.

McKenzie, E.H.C.; Jackson, G.V.H. 1986: The fungi, bacteria and pathogenic algae of Solomon Islands. RAS/83/001 Field Document 11. Suva, Fiji. 282pp.

McKenzie, E.H.C.; Jackson, G.V.H. 1990a: The fungi, bacteria and pathogenic algae of the Republic of Palau. *SPC Technical Paper 198.* 41pp.

McKenzie, E.H.C.; Jackson, G.V.H. 1990b: The fungi, bacteria and pathogenic algae of the Federated States of Micronesia. *SPC Technical Paper 199.* 67pp.

Pennycook, S.R. 1989: Plant diseases recorded in New Zealand. Plant Diseases Division, Auckland, New Zealand. 3 vols.

Sydow, H. 1924: Beiträge zur Kenntnis der Pilzflora Neu-Seelands - 1. *Annales Mycologici 22*: 293-317.

Takishima, Y.; Shimura, J.; Ugawa, Y.; Sugawara, H. 1989: Guide to World Data Center on Microorganisms with a list of culture collections in the world. Saitama, Japan. 249pp.

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THE FUNGI

Acanthophysium biapiculatum G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 145*: 165 & 330, 1963
on dead bark and wood of *Fuchsia excorticata*, Nelson, Murchison, 170 m, [28 Apr 1956, S.D. Brook, P.J. Brook] (PDD 17457).

Acanthophysium fasciculatum G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 145*: 167 & 330, 1963
Alectryon excelsus, Wellington, Carters Reserve, Carterton, 50 m, [18 Dec 1952, G.H. Cunningham] (PDD 17690).

Acanthophysium pulvinatum G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 145*: 164 & 330, 1963
Beilschmiedia tawa, Auckland, Lake Rotoehu, 400 m, [16 Oct 1956, G.H. Cunningham] (PDD 17441).

Acarosporina hyalina P.R. Johnston, *Mycotaxon 24*: 350, 1985
dead twig of *Actinidia deliciosa*, Bay of Plenty, Te Puke, DSIR Research Orchard, 21 Jun 1982, G.J. Samuels, S.R. Pennycook (PDD 45045).

Acremonium loliae [lolii] G.C.M. Latch, M.J. Christensen & G.J. Samuels, *Mycotaxon 20*: 537-9, 1984
leaf of *Lolium perenne*, [Wairarapa], Castlepoint, 8 Sep 1981, G.C.M. Latch, M.J. Christensen (PDD 445170, cultotype ICMP 8360).

Acrogenospora gigantospora S.J. Hughes, *N.Z. Jl Bot. 16*: 314, 1978
on dead bark of *Weinmannia racemosa*, Westland, Lake Ianthe, Pukekura, 8 Apr 1963, S.J. Hughes (PDD 36096, isotype DAOM 109596).

Acrogenospora novae-zelandiae S.J. Hughes, *N.Z. Jl Bot. 16*: 315, 1978
Podocarpus sp., Canterbury Prov., Peel Forest, 16 Oct 1963, S.J. Hughes (PDD 21595, isotype DAOM 109597).

Aecidium celmisiae-discoloris G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 37 & 52, 1924
on leaves of *Celmisia discolor*, Otago, Tooth Peaks [1000 m], 7 Apr 1921, W.D. Reid (PDD 384).

Aecidium celmisiae-petiolatae G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 37 & 52-3, 1924
on leaves of *Celmisia petiolata*, Canterbury, Arthur's Pass, 1000 m, 15 Feb 1920, E.H. Atkinson (PDD 383). Teleomorph = *Puccinia celmisiae* G.H. Cunningham.

Aecidium celmisiae-petriei G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 38 & 53, 1924
on leaves of *Celmisia petrie*, Otago, Lake Harris Track 1100 m, 6 May 1921, W.D. Reid (PDD 382 [38526]).

Aecidium hebe G.H. Cunningham, *Trans. Proc. N.Z. Inst. 59*: 496, 1928
Hebe treadwellii, Canterbury, Mt Cook, Black Birch Creek, 1200 m, Jan 1928, G.H. Cunningham [PDD 3411].

Aecidium hupiro G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 36-7 & 53, 1924
on leaves & petioles of *Coprosma foetidissima*, Wellington, [Tararua Range], Mt Hector, Alpha hut, 1700 m, 15 Feb 1921, H. Hamilton, J.G. Myers (PDD 771). Maori name for host plant.

Aecidium kowhai G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 35 & 53, 1924
on branches of *Sophora tetraptera*, Nelson, Brightwater, 200 m, 18 May 1922, C. Nash, W.C. Hyde, G.H. Cunningham (PDD 763). Teleomorph = *Uromyces edwardsiae* G.H. Cunningham. Maori name for host plant.

Aecidium macrodontae G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 38-40 & 53, 1924
on leaves and petioles of *Olearia macrodonta*, Otago, Clinton Valley, The Track, 18 [15] Jan 1920, E.H. Atkinson (PDD 277).

Aecidium milleri G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 35 & 54, 1924
on leaves of *Aristotelia serrata*, Waimarino County, Pokaka, 800 m, 10 Feb 1922, D. Miller

(PDD 776 [9756]). Named for collector, D. Miller, Government Entomologist.

Aecidium myopori G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 35-6 & 54, 1924
Myoporum laetum, Wellington, Palmerston North, 250 m, [22] Feb 1921, G.H. Cunningham (PDD 404).

Aecidium myrsines R.F.R. McNabb, *Trans. R. Soc. N.Z. Bot. 1*: 112-4, 1962
Myrsine salicina, Wellington, Tararua Ranges, [Schormann Track], Mar 1955 [1 Feb 1956], R.M. Close (PDD 19171).

Aecidium otira G.H. Cunningham, *Trans. Proc. N.Z. Inst. 59*: 498, 1928
Olearia arborescens, Arthur's Pass, Canterbury, 900 m, [Jan 1928], G.H. Cunningham [PDD 38523]. Otira, township near site of collection.

Aecidium ranunculi-depressus G.H. Cunningham, *Trans. Proc. N.Z. Inst. 61*: 416, 1930
Ranunculus depressus, Otago, Mt Genivere, 1000 m, [15 Oct 1919], W.D. Reid [PDD 9765].

Aecidium ranunculi-insignis G.H. Cunningham, *Trans. Proc. N.Z. Inst. 61*: 413-4, 1930
Ranunculus insignis, Taranaki, Mt Egmont, 1200 m, [Jan 1926], H.H. Allan [PDD 2038].

Aecidium ranunculi-lyallii G.H. Cunningham, *Trans. Proc. N.Z. Inst. 61*: 415, 1930
Ranunculus lyallii, Canterbury, Mt Cook, Kea Point, 700 m, [Jan 1928], H.H. Allan, G.H. Cunningham [PDD 3152].

Aecidium ranunculi-monroi G.H. Cunningham, *Trans. Proc. N.Z. Inst. 61*: 415, 1930
Ranunculus monroi, Westland, Mt Trovatore, 1600-1700 m, [Feb 1928], G.H. Cunningham [PDD 3151].

Aecidium traversiae G.H. Cunningham, *Trans. Proc. N.Z. Inst. 59*: 498, 1928
Traversia baccharoides, Westland, Mt Mantell, 1700 m, Feb 1928, G.H. Cunningham [PDD 3392].

Aecidium westlandicum G.H. Cunningham, *Trans. Proc. N.Z. Inst. 59*: 495, 1928
Caltha novae-zelandiae, Canterbury, Mt Cook, Sebastopol Range, 1300 m, Jan 1928, G.H. Cunningham [PDD 3389].

Aeruginospora furfuracea E. Horak, *Beih. Nova Hedwigia 43*: 125-6, 1973
on soil under *Nothofagus, Metrosideros, Weinmannia, Senecio*, etc., Prov. Westcoast, Ngahere, Kopara, Bell Hill Junction, 29 Mar 1968, E. Horak (PDD 27075, isotype ZT 68/231).

Agaricus bambusae Beeli var. **australis** P. Heinemann, *Bull. Jard. bot. nat. Belg. 44*: 356-7, 1974
ground under *Nothofagus cliffortioides*, Denton Range, NE of Te Anau, [30] Mar 1969, E. Horak (PDD 27106 [27102], isotype BR, ZT [69/194]).

Agaricus horakii P. Heinemann, *Bull. Jard. bot. nat. Belg. 44*: 359-61, 1974
sandy soil under *Metrosideros umbellata, Dacrydium cupressinum, Rhopalostylis sapida*, etc., Nelson, Kaihoka Reserve, [10] May 1968, E. Horak (PDD 27110 [27106], isotype ZT [68/411]). Named for collector, E. Horak, Austrian mycologist.

Agaricus lanatoniger P. Heinemann, *Bull. Jard. bot. nat. Belg. 44*: 361-3, 1974
ground under *Dacrydium cupressinum, Nothofagus fusca, Pseudowintera*, etc., Prov. Westland, Lake Haupiri, Kopara, [8] Dec 1967, E. Horak (PDD 27111 [27107], isotype BR, ZT [67/225]).

Agaricus oligocystis P. Heinemann, *Bull. Jard. bot. nat. Belg. 44*: 364-6, 1974
among litter, mosses and ferns under *Weinmannia, Hedycarya, Aristotelia*, etc., Prov. Westland, Big Wanganui, Hari Hari, [17] Feb 1969, E. Horak (PDD 27108 [27104], isotype BR, ZT [69/87]).

Agaricus purpureoniger P. Heinemann, *Bull. Jard. bot. nat. Belg. 44*: 363-4, 1974
under *Leptospermum ericoides*, Prov. Nelson, Cape Farewell, Wharariki, [13] May 1968, E. Horak (PDD 27109 [27105], isotype BR, ZT [68/435]).

Agaricus viridopurpurascens P. Heinemann, *Bull. Jard. bot. nat. Belg. 44*: 357-9, 1974
on sandy soil under *Nothofagus cliffortioides*, Prov. Canterbury, Kowai, southern slopes of Mt Grey, [16] Feb 1968, E. Horak (PDD 27107 [27103], isotype BR, ZT [68/79]).

Albugo mesembryanthemi S.D. Baker, *Trans. R. Soc. N.Z. 82*: 992, 1955

Mesembryantheum australe, Auckland, Piha, [16] Aug 1953, J.M. Dingley (PDD 12350).

Aleurodiscus aberrans G.H. Cunningham, *Trans. R. Soc. N.Z. 84*: 257, 1956
effused on bark of dead stems and branches of *Leptospermum scoparium*, Auckland, Mt Te Aroha, 1100 ft, [16] Dec 1953, G.H. Cunningham (PDD 15238).

Aleurodiscus coralloides G.H. Cunningham, *Trans. R. Soc. N.Z. 84*: 259-60, 1956
effused on bark of dead branches, twigs and standing dead saplings of *Nothofagus cliffortioides*, [Wellington, Mt Tongariro, 1000 m, Jan 1946, G.H. Cunningham] (PDD 4971).

Aleurodiscus coronatus G.H. Cunningham, *Trans. R. Soc. N.Z. 84*: 262, 1956
effused on bark of dead branches and twigs of *Leucopogon fasciculatus*, Auckland, Hunua Range, Orere, 900 ft, [1] Mar 1953, J.M. Dingley (PDD 12482).

Aleurodiscus ochraceo-flavus C.G. Lloyd, *Mycol. Notes 70*: 1228, 1923
[*Leptospermum scoparium*, Wellington, York Bay, Aug 1922, G.H. Cunningham] [PDD 630].

Aleurodiscus parmuliformis G.H. Cunningham, *Trans. R. Soc. N.Z. 84*: 244-6, 1956
adnate on bark of dead branches of *Weinmannia racemosa*, Auckland, Mamaku Forest, 1800 ft, [11] Sep 1954, G.H. Cunningham (PDD 15218).

Aleurodiscus patellaeformis [patelliformis] G.H. Cunningham, *Trans. R. Soc. N.Z. 84*: 243, 1956
scattered on bark of dead branches of *Phyllocladus alpinus*, Wellington, Mt Ruapehu, Whakapapa Valley, 3000 ft, [19] Oct 1949, J.M. Dingley (PDD 7449).

Aleurodiscus pateriformis G.H. Cunningham, *Trans. R. Soc. N.Z. 84*: 243-4, 1956
scattered or crowded on bark of dead stems of *Olearia rani*, Wellington, Tararuas, Gable-end Ridge, 2500 ft, Nov 1932, E.E. Chamberlain (PDD 3837).

Aleurodiscus peziculoides E.M. Wakefield, *Bull. misc. Inf. R. bot. Gdns Kew 1931*: 201, 1931
on dead twigs on the forest floor [*Nothofagus fusca*], Wellington, York Bay, [27] Jul 1923, E.J. Butler, G.H. Cunningham (PDD 1210).

Amanita karea G.S. Ridley, *Aust. Syst. Bot. 4*: 340, 1991
under *Nothofagus truncata*, Wellington, Rimutaka Forest Park, Orongorongo Track, 25 Mar 1987, G.S. Ridley (PDD 56192). Kare, a ripple, from Maori, referring to the concentric or ripple-like arrangement of volva remnants on the pileus.

Amanita mumura G.S. Ridley, *Aust. Syst. Bot. 4*: 345-7, 1991
under *Nothofagus truncata*, Wellington, Rimutaka Forest Park, Orongorongo Valley, Paua Ridge, 29 Apr 1987, G.S. Ridley (PDD 56203). Mumura, blushing, from Maori, referring to the colour of the basidiocarp on drying.

Amanita nehuta G.S. Ridley, *Aust. Syst. Bot. 4*: 331, 1991
under *Nothofagus truncata*, Wellington, Rimutaka Forest Park, Orongorongo Valley, Paua Ridge, 25 Mar 1987, G.S. Ridley (PDD 56157). Nehu, dust, from Maori, referring to the pulverulent volva remnants on the pileus.

Amanita pareparina G.S. Ridley, *Aust. Syst. Bot. 4*: 343-5, 1991
under *Nothofagus truncata*, Wellington, Rimutaka Forest Park, Orongorongo Valley, Paua Ridge, 22 Apr 1987, G.S. Ridley (PDD 56200). Parepare, a palisade, from Maori, referring to the arrangement of the volva scales at base of stipe.

Amanita pekeoides G.S. Ridley, *Aust. Syst. Bot. 4*: 333-4, 1991
under *Nothofagus truncata*, Wellington, Rimutaka Forest Park, Orongorongo Valley, Paua Ridge, 1 Apr 1987, G.S. Ridley (PDD 56146). Peke, a sack or bag, from Maori, referring to the saccate volva.

Amanita pumatona G.S. Ridley, *Aust. Syst. Bot. 4*: 342, 1991
under *Nothofagus truncata*, Wellington, Rimutaka Forest Park, Orongorongo Track, 5 Nov 1987, G.S. Ridley (PDD 56197). Puma, grey, and tona, a wart, from Maori, referring to the abundant, grey pileus warts.

Amanita taiepa G.S. Ridley, *Aust. Syst. Bot. 4*: 328-9, 1991
under *Nothofagus truncata*, Wellington, Rimutaka Forest Park, Orongorongo Track, 18 Mar

1987, S. Brodie, [G.S. Ridley, S. Frisby] (PDD 56152). Taiepa, a fence, from Maori, referring to the fence-like volva limb.

Antennatula dingleyae S.J. Hughes, *N.Z. Jl Bot. 12*: 337, 1974

on living branches of *Discaria toumatou*, Canterbury Province, Hawdon Valley, Woolshed Hill, 16 May 1963, S.J. Hughes (PDD 25768, isotype DAOM 96663). Named for J.M. Dingley, New Zealand mycologist.

Antennatula fisherae S.J. Hughes, *N.Z. Jl Bot. 12*: 335, 1974

on living branches of *Melicope simplex*, Canterbury Province, Banks Penninsula, near Little River, 13 May 1963, S.J. Hughes (PDD 25767, isotype DAOM 96068). Named for E. E. Fisher in recognition of her contribution to our knowledge of sooty moulds.

Antennatula fraserae S.J. Hughes, *N.Z. Jl Bot. 12*: 341-2, 1974

on living branches of *Nothofagus fusca*, Canterbury Province, Hawdon Valley, Woolshed Hill, 16 May 1963, S.J. Hughes (PDD 25769, isotype DAOM 97301). Named for L.R. Fraser, Australian virologist, in recognition of her contribution to our knowledge of sooty moulds.

Antennatula triseptata S.J. Hughes, *N.Z. Jl Bot. 12*: 333-4, 1974

on living branches of *Myrsine australis*, Canterbury Province, near Ashley Gorge, 14 May 1963, S.J. Hughes (PDD 25766, isotype DAOM 96594).

Apiospora setosa G.J. Samuels, E.H.C. McKenzie & D.E. Buchanan, *N.Z. Jl Bot. 19*: 142, 1981

on dead culms of *Bambusa* sp., Auckland, Kohimarama, Nov 1979, G.J. Samuels (PDD 41017). Anamorph = *Cordella johnstonii* M.B. Ellis.

Apiospora tintinnabula G.J. Samuels, E.H.C. McKenzie, D.E. Buchanan, *N.Z. Jl Bot. 19*: 146, 1981

on dead culm of *Bambusa* sp., Waikato, Paeroa, 28 Feb 1980, E.H.C. McKenzie, P.R. Johnston (PDD 41022). Anamorph = *Scyphospora phyllostachydis* L. Kantschaveli.

Apostrasseria ambigua T.R. Nag Raj & W.B. Kendrick in Nag Raj, *Can. J. Bot. 61*: 15-17, 1983

on leaves of *Podocarpus totara*, Forest Hill Scenic Reserve, 18 mi N of Invercargill, 18 Apr 1974, W.B. Kendrick (PDD 41572).

Arachnopeziza rhopalostylidis R.W.G. Dennis, *Kew Bull. 15*: 302-3, 1962

on leaves of *Rhopalostylidis sapida*, Auckland, Waitakere Ra., Henderson, [Mountain Road], 11 Dec [Jun] 1955, J.M. Dingley (PDD 18975).

Ascochyta stilbocarpae H. Sydow, *Ann. Mycol. 22*: 311, 1924

on leaves of *Stilbocarpa polaris*, Dunedin, 14 Dec 1919, G.H. Cunningham (PDD 1047).

Asteridiella knightiae S.J. Hughes, *N.Z. Jl Bot. 16*: 358, 1978

on living leaves of *Knightia excelsa*, North Auckland, Waipoua, 17 Jun 1963, S.J. Hughes (PDD 30418, isotype DAOM 93448).

Asteromella myriadea M.C. Cooke, *Grevillea 19*: 3, 1890

on coriaceous leaves, [Wairarapa, Norsewood, Mar 1886], W. Colenso b432 [PDD 42974, holotype K].

Astrosporina aequalis E. Horak, *N.Z. Jl Bot. 15*: 741, 1977

on soil under *Leptospermum* (*L. scoparium, L. ericoides*), Auckland, Waitakere Range, Fern Track, 9 May 1974, J.M. Dingley (PDD 32335 [27115], isotype ZT 74/542).

Astrosporina amygdalina E. Horak, *N.Z. Jl Bot. 15*: 739, 1977

on soil under *Leptospermum scoparium* in coastal forests, Westland, Okarito Trig, 19 Feb 1969, E. Horak (PDD 27114, isotype ZT 69/97).

Astrosporina avellana E. Horak, *N.Z. Jl Bot. 15*: 744, 1977

on soil in *Nothofagus* forests (*N. cliffortioides, N. menziesii, N. fusca*), Westcoast, Lake Haupiri, Kopara, 8 Dec 1967, E. Horak (PDD 27118, isotype ZT 67/222).

Astrosporina graveolens E. Horak, *N.Z. Jl Bot. 15*: 743-4, 1977

on soil among litter of *Leptospermum scoparium* (and *Nothofagus cliffortioides*), Nelson, Lake Rotoiti, West Bay, 29 Apr 1968, E. Horak (PDD 27116, isotype ZT 68/317).

Astrosporina leptospermi E. Horak, *N.Z. Jl Bot. 15*: 744, 1977
on soil under *Leptospermum scoparium*, Stewart I., Long Hairy [Harry] Bay, 18 Mar 1969, E. Horak (PDD 27117, isotype ZT 69/152).

Astrosporina manukanea E. Horak, *N.Z. Jl Bot. 15*: 734, 1977
on soil under *Leptospermum ericoides*, Nelson, between Collingwood and Pakawau, 8 May 1968, E. Horak (PDD 27110, isotype ZT 68/394). Maori name for plant under which specimen was found.

Astrosporina paracerasphora E. Horak, *N.Z. Jl Bot. 15*: 731, 1977
on rotten wood of *Nothofagus fusca*, Westcoast, Lake Haupiri, Kopara, 8 Dec 1967, E. Horak (PDD 27108, isotype ZT 67/234).

Astrosporina scissa E. Horak, *N.Z. Jl Bot. 15*: 738, 1977
on soil in *Nothofagus* forests (*N. cliffortioides, N. fusca*, rarely under *Leptospermum scoparium*), Westcoast, Kopara, 18 Jan 1968, E. Horak (PDD 27113, isotype ZT 68/40).

Astrosporina straminea E. Horak, *N.Z. Jl Bot. 15*: 736, 1977
on sand in dunes, under *Leptospermum scoparium*, Stewart I., W of Xmas [Christmas] Village, 18 Mar 1969, E. Horak (PDD 27112, isotype ZT 69/151).

Astrosporina subclavata E. Horak, *N.Z. Jl Bot. 15*: 734, 1977
on soil under *Nothofagus menziesii* and *N. fusca*, Nelson, Murchison, Matakitaki, 28 Jan 1969, E. Horak (PDD 27111, isotype ZT 69/36).

Astrosporina viscata E. Horak, *N.Z. Jl Bot. 15*: 733-4, 1977
on soil in *Nothofagus* forests (*N. cliffortioides, N. menziesii*), Westcoast, Lake Hochstetter, 17 Mar 1968, E. Horak (PDD 27109, isotype ZT 68/177).

Atricordyceps harposporifera G.J. Samuels, *N.Z. Jl Bot. 21*: 174, 1983
on arthropod, Auckland, Waitakere Ranges, Waitemata City, Fairy Falls Track, off Mountain Road, 12 Aug 1981, G.J. Samuels, P.R. Johnston, R.E. Beever, R.P. Korf, J.W. Paden (PDD 42208). Anamorph = *Harposporium anguillulae* G. Lohde.

Auricula totarae C.G. Lloyd, *Mycol. Notes 62*: 935, 1920
on dead totara stump [*Podocarpus totara*], Weraroa, [12 Jul 1919], G.H. Cunningham [PDD 225].

Bactridium novae-zelandiae S.J. Hughes, *N.Z. Jl Bot. 4*: 526, 1966
rotten wood, Canterbury Prov., Kelsey's Bush, near Waimate, 17 Oct 1963, S.J. Hughes (PDD 25073, isotype DAOM 110267).

Bactrodesmiella novae-zelandiae S.J. Hughes, *N.Z. Jl Bot. 27*: 449, 1989
on the inner surface of bark of *Nothofagus truncata*, Westland, Granville Forest, Mt Elliott, Ahaura, 2 Apr 1963, S.J. Hughes (PDD 36107, holotype DAOM 93818g).

Badhamia calvescens T.H. Macbride, *Mycologia 18*: 129, 1926
[on grasses, Auckland, Auckland Domain, Jan 1924, T. Patterson] [PDD 3616].

Bipolaris novae-zelandiae A. Sivanesan, *Trans. Br. mycol. Soc. 84*: 406-8, 1985
soil, Nelson, Motueka, 25 Oct 1977 [29 Mar 1977], K.N. [R.N.] Brunette ([PDD 50639], holotype IMI 222864).

Bivallum zelandicum P.R. Johnston, *Aust. Syst. Bot. 4*: 356, 1991
on *Dacrydium cupressinum*, Stewart I., The Neck, track between Glory Cove and Chew Tobacco Bay, 5 May 1984, P.R. Johnston, H. Donner (PDD 56290).

Boletus leptospermi R.F.R. McNabb, *N.Z. Jl Bot. 6*: 170, 1968
solitary, gregarious, or caespitose under *Leptospermum ericoides* and *L. scoparium*, Auckland, Titirangi, 13 Jun 1964, R.F.R. McNabb (PDD 24629).

Boletus novae-zelandiae R.F.R. McNabb, *N.Z. Jl Bot. 6*: 172-3, 1968
gregarious under *Leptospermum ericoides* and *L. scoparium*, Auckland, Kerikeri, Opito Bay, 26 Apr 1966, G.B. Rawlings (PDD 25896).

Boletus rawlingsii R.F.R. McNabb, *N.Z. Jl Bot. 6*: 171, 1968
solitary or gregarious under *Leptospermum scoparium*, Auckland, Kerikeri, Opito Bay, 16 May 1966, R.F.R. McNabb (PDD 25266). Named for G.B. Rawlings who first collected this

fungus and whose field work on the introduced Boletaceae deserves recognition.

Botryosphaeria macrolopha H. Sydow, *Ann. Mycol. 22*: 300, 1924
on cankers on living branches of *Coprosma robusta*, Wellington, York Bay, 28 Mar 1923, E.H. Atkinson (PDD 940).

Botryosphaeria parva S.R. Pennycook & G.J. Samuels, *Mycotaxon 24*: 455-6, 1985
on small dead branches of *Populus nigra*, Bay of Plenty, Te Puke, No. 3 Road, Baldwin orchard, 17 Dec 1981, S.R. Pennycook (PDD 45438, cultotype ICMP 8003, ATCC 58191). Anamorph = *Fusicoccum parvum* Pennycook & Samuels.

Bovista purpurea C.G. Lloyd, *Mycol. Notes 69*: 1201, 1923
[on ground, sand dunes, Nelson, Mapua, 17 May 1922, G.H. Cunningham] [PDD 700].

Bovistella nigrica C.G. Lloyd, *Mycol. Notes 66*: 1115, 1922
[on ground in sand, Wellington, Levin, Weraroa, 9 Nov 1919, G.H. Cunningham] [PDD 335].

Brachysporium dingleyae S.J. Hughes, *N.Z. Jl Bot. 3*: 27, 1965
on rotten wood of *Laurelia novae-zelandiae*, Westland Province, Little Wanganui River, Hari Hari, 6 Apr 1963, S.J. Hughes (PDD 20765, isotype DAOM 93524). Named for J.M. Dingley, New Zealand mycologist.

Brachysporium novae-zelandiae S.J. Hughes, *N.Z. Jl Bot. 3*: 29, 1965
rotten wood of *Leptospermum scoparium*, Auckland Province, Mamaku State Forest, 22 Mar 1963, S.J. Hughes (PDD 20721, isotype DAOM 93527).

Caeoma kaiku G.H. Cunningham, *Trans. Proc. N.Z. Inst. 61*: 416-7, 1930
Parsonsia capsularis x *P. heterophylla*, Wellington, Waimarino, 460 m, [Feb 1930], J.C. Neill [PDD 3471]. Maori name for host plant.

Caeoma peltatum C.G. Shaw III & C.G. Shaw, *Trans. Br. mycol. Soc. 67*: 506, 1976
Phyllocladus trichomanoides, Tihoi State Forest, 14 Nov 1975, M.A. Stoodley (PDD 34608, isotype NZFRI, BPI, WSP 60490).

Calonectria novae-zealandiae J.M. Dingley, *Trans. Proc. R. Soc. N.Z. 79*: 404-5, 1952
Discaria toumatou, Canterbury, Hooker moraine, [21] Feb 1947, J.M. Dingley [PDD 10426].

Camarophyllus aurantiopallens E. Horak, *Beih. Nova Hedwigia 43*: 122-3, 1973
amongst mosses under *Leptospermum scoparium* (and *Nothofagus cliffortioides*), Prov. Nelson, Westbay of Lake Rotoiti, 29 Apr 1968, E. Horak (PDD 27088, isotype ZT 68/309).

Camarophyllus canus E. Horak, *Beih. Nova Hedwigia 43*: 120-1, 1973
on soil amongst mosses under *Leptospermum scoparium* (and *Nothofagus cliffortioides*), Prov. Southland, NE of Te Anau, Denton Range, 30 Mar 1969, E. Horak (PDD 27073, isotype ZT 69/199).

Camarophyllus delicatus E. Horak, *Beih. Nova Hedwigia 43*: 121, 1973
on soil amongst mosses in *Nothofagus* forest (*N. fusca, N. menziesii, N. cliffortioides*), Prov. Canterbury, Mt Grey, Kowai Bush, 25 Sep 1967, E. Horak (PDD 27087, isotype ZT 67/136).

Camarophyllus griseorufescens E. Horak, *N.Z. Jl Bot. 28*: 277, 1990
in mixed forest, North Auckland, Little Barrier I., Mt Hauturu, 12 Jun 1981, E. Horak (PDD 27230).

Camarophyllus impurus E. Horak, *N.Z. Jl Bot. 28*: 276, 1990
under *Leptospermum scoparium*, North Auckland, Waitakere Ranges, Mill Bay, 29 Jun 1981, E. Horak (PDD 27226).

Camarophyllus patinaecolor E. Horak, *Beih. Nova Hedwigia 43*: 118-9, 1973
on soil amongst litter of *Weinmannia, Metrosideros, Schefflera, Cyathea*, etc., N of Mt Egmont, Rahiri Lodge, 17 Jun 1968, E. Horak (PDD 27072, isotype ZT 68/556).

Camarophyllus pratensis (Fr.) Kummer var. **gracilis** E. Horak, *Beih. Nova Hedwigia 43*: 123-5, 1973
on soil under *Phyllocladus trichomanoides, Dacrydium cupressinum, Cyathea*, etc., Coromandel Peninsula, Kauaeranga Valley, 8 Jul 1968, E. Horak (PDD 27074, isotype ZT 68/651).

Camarops flava G.J. Samuels & J.D. Rogers, *Mycotaxon 28*: 52-4, 1987
on decaying polypore, Northland, Hokianga County, Omahuta State Forest, Kauri Reserve,

1 Jun 1982, G.J. Samuels, A. Hawthorne, P.R. Johnston, R.H. Petersen (PDD 47426).

Capnobotrys atro-olivacea S.J. Hughes, *N.Z. Jl Bot. 19*: 208, 1981
on bark at base of trunk of *Nothofagus fusca*, Westland, Granville Forest, Orwell Creek, Ahaura, 2 Apr 1963, S.J. Hughes (PDD 36102, isotype DAOM 106914).

Capnobotrys australis S.J. Hughes, *N.Z. Jl Bot. 19*: 211, 1981
on corticated trunks of *Nothofagus fusca*, Canterbury, Woolshed Hill, Hawdon Valley, 16 May 1963, J.M. Dingley (PDD 21098, holotype DAOM 106380). Synanomorph = *Capnophialophora* sp.

Capnobotrys dingleyae S.J. Hughes, *Mycotaxon 1*: 121-2, 1974
on living trunks of *Podocarpus spicatus*, [Mid Canterbury], Banks Peninsula, [Price's Bush near Little River], 13 May 1963, S.J. Hughes (PDD 21096, isotype DAOM 106368). Teleomorph = *Metacapnodium dingleyae* Hughes. Named for J.M. Dingley, New Zealand mycologist.

Capnobotrys laterivecta S.J. Hughes, *N.Z. Jl Bot. 19*: 216-8, 1981
on corticated trunks of *Weinmannia racemosa*, Westland, Swamp Forest, Harihari, 7 Apr 1963, S.J. Hughes (PDD 21016, isotype DAOM 106385a).

Capnobotrys pacifica S.J. Hughes, *N.Z. Jl Bot 19*: 218, 1981
on leaves of *Coprosma tenuifolia*, Wellington Province, Mt Ruapehu, 610 m, Dec 1966, J.M. Dingley (PDD 25871, isotype DAOM 117157c). Synanomorph = *Capnophialophora* sp.

Capnobotrys paucispora S.J. Hughes, *N.Z. Jl Bot. 19*: 221, 1981
on twigs and leaves of *Metrosideros diffusa*, Wellington Province, Tongariro National Park, Erua, 6 Mar 1963, S.J. Hughes (PDD 21035, isotype DAOM 97068b).

Capnocybe fraserae S.J. Hughes, *N.Z. Jl Bot. 4*: 336, 1966
on leaves of *Rhopalostylis sapida*, Auckland Province, Waitakere Range, Piha, 31 Jan 1963, S.J. Hughes (PDD 20518, isotype DAOM 97356). Named for L.R. Fraser, Australian virologist, in recognition of her contribution to our knowledge of sooty moulds.

Capnocybe novae-zelandiae S.J. Hughes, *N.Z. Jl Bot. 4*: 345, 1966
bark of *Nothofagus fusca*, Canterbury, Hawdon Valley, Woolshed Hill, 16 May 1963, S.J. Hughes (PDD 24945, isotype DAOM 97302a).

Capnokyma corticola S.J. Hughes, *N.Z. Jl Bot. 13*: 638-9, 1975
on bark of living *Olearia rani*, Auckland Province, Waitakere Range, Waiatarua, [Rangemore Track], 8 May 1963, S.J. Hughes (PDD 30412, isotype DAOM 97054).

Capnophialophora fraserae S.J. Hughes, *N.Z. Jl Bot. 4*: 352, 1966
on bark of *Leptospermum scoparium*, Auckland Province, Waitakere Range, Piha Stream, 11 Jun 1963, J.M. Dingley (PDD 21219, isotype DAOM 97369). Teleomorph = *Limacinia fraserae* S.J. Hughes. Named for L.R. Fraser, Australian virologist, in recognition of her contribution to our knowledge of sooty moulds.

Capronia acutiseta G.J. Samuels in E. Müller et al., *Trans. Br. mycol. Soc. 88*: 63-4, 1987
Dacrydium cupressinum, Westland County, Saltwater State Forest, 2-3 May 1974, G.J. Samuels (PDD 34068). Anamorph = *Exophiala* sp.

Capronia coronata G.J. Samuels in E. Müller et al., *Trans. Br. mycol. Soc. 88*: 65, 1987
on decorticated wood, Westland County, Nemona State Forest, 5 May 1974, G.J. Samuels (PDD 35308). Anamorph = *Exophiala* sp.

Capronia villosa G.J. Samuels in E. Müller et al., *Trans. Br. mycol. Soc. 88*: 70, 1987
decorticated wood, Westland, Central Granville State [Forest, Aharua], 7-8 May 1974, G.J. Samuels (PDD 36629).

Catastoma purpurea C.G. Lloyd, *Mycol. Notes 66*: 1120, 1922
on sand, [Wellington, Weraroa, sandhills, Nov 1919, E.H. Atkinson, S.A. Cunningham, G.H. Cunningham] [PDD 346].

Catenularia longispora S.J. Hughes, *N.Z. Jl Bot. 3*: 141, 1965
rotten wood, Auckland Prov., Waitakere Ranges, Henderson Valley, Walker Bush, 30 Jan 1963, S.J. Hughes (PDD 20523, isotype DAOM 93562).

Catenularia macrospora S.J. Hughes, *N.Z. Jl Bot. 3*: 143, 1965
rotten wood, Auckland Prov., Mangorewa Gorge, 20 Mar 1963, S.J. Hughes (PDD 20676, isotype DAOM 93560a).

Ceratosporella novae-zelandiae S.J. Hughes, *N.Z Jl Bot. 9*: 352-4, 1971
on decaying wood of *Coprosma australis*, North Auckland, Coromandel Peninsula, Whangapoua Saddle, 5 Sep 1963, S.J. Hughes (PDD 28707, isotype DAOM 110205).

Cercospora aristoteliae M.C. Cooke, *Grevillea 19*: 4, 1890
on leaves of *Aristotelia racemosa*, [Hawkes Bay, Dannevirke], W. Colenso b857 [PDD 39222, holotype K].

Cercospora eragrostis E.H.C. McKenzie & G.C.M. Latch, *N.Z. Jl agric. Res. 27*: 113, 1984
Eragrostis brownei, Auckland, Waitakere Range, 22 Apr 1975, J.M. Dingley (PDD 43152).

Cercospora haloragi J.M. Dingley, *N.Z. Jl agric. Res. 8*: 913, 1965
Haloragis erecta, Auckland, Piha, Jun 1954 [31 Jan], J.M. Dingley (PDD 20086).

Cercospora karaka G.F. Laundon, *Trans. Br. mycol. Soc. 60*: 320-1, 1973
Corynocarpus laevigatus, Levin, Waiopehu Reserve, 22 Apr 1970, G.F. Laundon (LEV 4165 [PDD 50613], isotype IMI 165055). Maori name for host plant.

Cercospora microlaenae E.H.C. McKenzie & G.C.M. Latch, *N.Z. Jl agric. Res. 27*: 115, 1984
Microlaena stipoides, Auckland, Mt Albert, 1 Dec 1982, E.H.C. McKenzie (PDD 43153).

Cercosporella bromivora G.C.M. Latch, *N.Z. Jl agric. Res. 8*: 960, 1965
on living leaves of *Bromus willdenowii*, Palmerston North, May 1960 [5 Sep 1962], G.C.M. Latch (PDD 23809).

Chaetopsina penicillata G.J. Samuels, *Mycotaxon 22*: 24-6, 1985
on bark of *Beilschmiedia tawa*, Auckland, Waitemata City, Waitakere Ranges, Piha Rd., Marguerite Track, 21 Mar 1977, G.J. Samuels (PDD 44235, cultotype ATCC 56205, ICMP 7801). Teleomorph = *Nectria chaetopsinae-pencillatae* Samuels.

Chaetopsis probosciophora F. DiCosmo, S. Berch & W.B. Kendrick, *Mycologia 75*: 962-6, 1983
on leaf-litter of *Agathis australis*, Little Barrier I., near Te Wairere Stream, 9 Mar 1974, W.B. Kendrick (PDD 40560).

***Chaetoscypha nidulans** H. Sydow, *Ann. Mycol. 22*: 305, 1924
on fallen leaves of *Olearia colensoi*, Otago, Bealey River, 13 Dec 1920, E.H. Atkinson (PDD 1024).

Chaetosphaeria aotearoae S.J. Hughes, *N.Z. Jl Bot. 4*: 78-80, 1966
on rotten wood and bark of *Freycinetia banksii*, Auckland Province, Ruaotowhenua, Waitakere Range, 7 Aug 1963, S.J. Hughes (PDD 21403, isotype DAOM 93903b). Anamorph = *Sporoschisma mirabile* Berk. & Br. Maori name for New Zealand.

Chaetosphaeria brevispora E. Shoemaker in S.J. Hughes & W.B. Kendrick, *N.Z. Jl Bot. 6*: 373-4, 1968
on bark of *Nothofagus solandri* var. *cliffortioides*, Wellington Prov., Tongariro National Park, Whakapapanui Track, 5 Mar 1963, S.J. Hughes (PDD 20647, isotype DAOM 96413c). Anamorph = *Zanclospora brevispora* S.J. Hughes & W.B. Kendrick.

Chaetosphaeria dingleyae S.J. Hughes, W.B. Kendrick & E. Shoemaker in Hughes & Kendrick, *N.Z. Jl Bot. 6*: 343, 1968
rotten wood, Auckland Prov., Auckland, Epsom, 27 Jan 1963, S.J. Hughes (PDD 25076, isotype DAOM 97328). Named for J.M. Dingley, New Zealand mycologist.

Chaetosphaeria novae-zelandiae S.J. Hughes & E. Shoemaker in Hughes, *N.Z. Jl Bot. 3*: 138, 1965
on rotten wood of *Metrosideros robusta*, Auckland Prov., Waitakere Ranges, Upper Piha Valley, [Home Track], 9 Oct 1963, J.M. Dingley (PDD 21603, isotype DAOM 93575).

Chaetosphaeria pulchriseta S.J. Hughes, W.B. Kendrick & E. Shoemaker in Hughes & Kendrick, *N.Z. Jl Bot. 6*: 356-7, 1968 on rotten wood and bark of *Leptospermum scoparium*, Auckland Prov., Cornwallis, 3 Jan 1963, S.J. Hughes (PDD 25757 [26228], isotype DAOM 93528b).

Chalara aotearoa T.R. Nag Raj & S.J. Hughes, *N.Z. Jl Bot. 12*: 120-1, 1974

bark of dead *Aristotelia serrata*, Westland, Little Wanganui River, Harihari, 6 Apr 1963, J.M. Dingley (PDD 30405, isotype DAOM 110033b [111033b]). Maori name for New Zealand.

Chalara bicolor S.J. Hughes in T.R. Nag Raj & Hughes, *N.Z. Jl Bot. 12*: 122-4, 1974

decayed wood, Auckland Province, Pureora, 21 Mar 1963, S.J. Hughes (PDD 30410, isotype DAOM 110018).

Chalara brevipes T.R. Nag Raj & W.B. Kendrick, A Monograph of Chalara and Allied Genera: 95-7, 1975

on dead leaves of *Podocarpus dacrydioides*, Canterbury Prov., Peel Forest Pk., Big Tree Tr., 21 [26] Apr 1974, W.B. Kendrick (PDD 32844).

Chalara brunnipes T.R. Nag Raj & W.B. Kendrick, A Monograph of Chalara and Allied Genera: 99, 1975

dead leaves of *Nothofagus fusca*, Orewera [Urewera] Nat. Pk., [Lake Waikaremoana], Cascade Falls Tr., 24 Mar 1974, W.B. Kendrick (PDD 32845).

Chalara constricta T.R. Nag Raj & W.B. Kendrick, A Monograph of Chalara and Allied Genera: 103, 1975

leaves of *Agathis australis*, Little Barrier I., nr. stream S of Te Wairere, 9 Mar 1974, W.B. Kendrick (PDD 32854).

Chalara dictyoseptata T.R. Nag Raj & S.J. Hughes, *N.Z. Jl Bot. 12*: 128, 1974

decayed stems of *Ripogonum scandens*, Westland, Little Wanganui River, Harihari, 6 Apr 1963, S.J. Hughes (PDD 30407, isotype DAOM 93336a).

Chalara graminicola E.H.C. McKenzie, *N.Z. Jl Bot. 20*: 245, 1982

on dead leaves of *Chionochloa* sp., Fiordland, Secretary I., 29 Nov 1981, C.F. Butcher (PDD 41807).

Chalara nothofagi T.R. Nag Raj & W.B. Kendrick, A Monograph of Chalara and Allied Genera: 126, 1975

dead leaves of *Nothofagus solandri* var. *cliffortioides*, Arthur's Pass Nat. Pk., Scott's Tr., 27 Apr 1974, W.B. Kendrick (PDD 32847).

Chalara novae-zelandiae T.R. Nag Raj & W.B. Kendrick, A Monograph of Chalara and Allied Genera: 126-7, 1975

on dead leaves of *Nothofagus menziesii*, Mt Cook Nat. Pk., Governor's Bush Tr., 25 Apr 1974, W.B. Kendrick (PDD 32848).

Chalara parvispora T.R. Nag Raj & S.J. Hughes, *N.Z. Jl Bot. 12*: 117, 1974

on decayed *Cyathea medullaris*, Auckland Province, Upper Piha Valley, Waitakere Range, [Centennial Track], 2 May 1963, J.M. Dingley (PDD 30406, isotype DAOM 110036).

Chalara pulchra T.R. Nag Raj & S.J. Hughes, *N.Z. Jl Bot. 12*: 126, 1974

on inner surface of bark of *Weinmannia racemosa*, Westland Province, Lake Ianthe, Pukekura, 8 Apr 1963, S.J. Hughes (PDD 30408, isotype DAOM 110020).

Chalara scabrida T.R. Nag Raj & W.B. Kendrick, A Monograph of Chalara and Allied Genera: 133-4, 1975

on dead leaves of *Agathis australis*, Little Barrier I., Summit Tr., 7 Mar 1974, W.B. Kendrick (PDD 32857).

Chalara stipitata T.R. Nag Raj & W.B. Kendrick, A Monograph of Chalara and Allied Genera: 135-6, 1975

dead leaves of *Agathis australis*, Auckland, Titirangi, Atkinson's Park, 15 May 1974, W.B. Kendrick (PDD 32638).

Chalara unicolor S.J. Hughes & T.R. Nag Raj in Nag Raj & Hughes, *N.Z. Jl Bot. 12*: 121-2, 1974

decayed wood of *Leptospermum scoparium*, Auckland Prov., Waitakere Range, Kitekite Stream, 31 Jan 1963, S.J. Hughes (PDD 30409, isotype DAOM 110019).

Chalarodes bisetis E.H.C. McKenzie, *Mycotaxon 42*: 91, 1991
on dead leaves of *Freycinetia baueriana* ssp. *banksii*, Auckland, Waitakere Ranges, Spraggs Bush, 19 Apr 1987, R.E. Beever (PDD 57220).

Chlorovibrissea phialophora G.J. Samuels & L. Kohn in Kohn, *Mem. N.Y. Bot. Gdn 49*: 116-7, 1989
on decaying *Leptospermum* sp., Auckland, Waitakere Ranges, Waitemata City, across rd. from Nihotupu Dam, 1 Sep 1982, P.R. Johnston (PDD 46963, isotype CUP).

Cintractia oreoboli K. Vánky & E.H.C. McKenzie, *N.Z. Jl Bot. 28*: 249, 1990
Oreobolus strictus, North Canterbury, Arthur's Pass, 921 m, 26 Feb 1988, E.H.C. McKenzie, P.R. Johnston (PDD 55671, holotype HUV 14717, isotype BRIP).

Cintractia schoenus G.H. Cunningham, *Trans. Proc. N.Z. Inst. 59*: 503, 1928
Schoenus pauciflorus, Canterbury, Cook Range, 700 m, Jan 1928, G.H. Cunningham [PDD 3365].

Cintractia waiouru G.H. Cunningham, *Trans. Proc. R. Soc. N.Z. 75*: 335, 1945
Carpha alpina, Auckland, National Park, Waihouhounu Stream, [2] Apr 1945, J.M. Dingley [PDD 4364]. Refers to a small town, Waiouru, near collection site.

Circinotrichum papakurae S.J. Hughes & K.A. Pirozynski, *N.Z. Jl Bot. 9*: 40, 1971
Beilschmiedia tarairi, Auckland Prov., Papakura, Kirk's Bush, 15 Jan 1963, S.J. Hughes (PDD 28495, isotype DAOM 96409d).

Cirrosporium novae-zelandiae S.J. Hughes, *N.Z. Jl Bot. 18*: 329, 1980
on fallen corticated trunks of *Weinmannia racemosa*, Westland, Lower Poerua River, Harihari, 5 Apr 1963, S.J. Hughes (PDD 36101, isotype DAOM 113643).

Cladosporium scillae F.C. Deighton in G.F. Laundon, *N.Z. Jl Bot. 8*: 55, 1970
leaf spot on *Scilla peruviana*, Levin, 21 Dec 1965, G.F. Laundon (LEV 477 [PDD 25233], isotype IMI 116997).

Clavaria albo-globospora R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 35 & 150, 1988
on soil under kauri (*Agathis australis*), Waipoua Kauri Reserve, 23 Jul [Jun] 1981, R.H. Petersen, A. Hawthorne ([PDD 46658], isotype TENN).

Clavaria ardosiaca R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 35 & 151, 1988
on soil and humus under kauri (*Agathis australis*), Waipoua Kauri Reserve, 23 Jun 1981, R.H. Petersen, A. Hawthorne ([PDD 46656], isotype TENN).

Clavaria cupreicolor R.H. Petersen, *Bull. N.Z. Dep scient. ind. Res. 236*: 37 & 151, 1988
Auckland, Mill Bay, 29 Jun 1981, E. Horak ([PDD 46639], isotype TENN).

Clavaria echino-brevispora R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 37 & 151, 1988
soil and humus, Waipoua Kauri Reserve, vic. Forestry Headquarters, 21 Jun 1981, R.H. Petersen ([PDD 46669], isotype TENN).

Clavaria echino-nivosa R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 22 & 149, 1988
soil and humus, Waipoua Kauri Reserve, Big Kauri Tree Track to Te Matua Ngahere, 23 Jun 1981, R.H. Petersen ([PDD 46671], isotype TENN).

Clavaria echino-olivacea R.H. Petersen, *Bull. N.Z. Dep scient. ind. Res. 236*: 37 & 151, 1988
under kauri (*Agathis australis*) forest, Waipoua Kauri Reserve, vic. Forestry Headquarters, 25 Jun 1981, R.H. Petersen ([PDD 46635], isotype TENN).

Clavaria flavo-purpurea R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 28 & 150, 1988
on soil and humus, Waipoua Kauri Reserve, vic. Forestry Headquarters, 24 Jun 1981, R.H. Petersen ([PDD 46642], holotype TENN).

Clavaria humilis M.C. Cooke, *Grevillea 19*: 2, 1890
on rotten wood amongst moss, Maingaroa [Opotiki, Maungaroa], S. Berggren 398 [W. Colen-

so b398] [PDD 30394, holotype K].

Clavaria megaspinosa R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 41 & 151, 1988
rotten soggy wood and humus, Waipoua Kauri Reserve, across river from Forestry Headquarters, 24 Jun 1981, R.H. Petersen ([PDD 46636], isotype TENN).

Clavaria mima R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 41 & 151, 1988
[ground under tree ferns], Pelorus Scenic Reserve, 19 May 1982, [R.H. Petersen] ([PDD 46641], isotype TENN).

Clavaria musculo-spinosa R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 42 & 151, 1988
base of big tree, Waipoua Kauri Reserve, Te Matua Ngahere, 31 May 1982, R.H. Petersen ([PDD 46676], isotype TENN).

Clavaria novo-zealandica R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 29 & 150, 1988
[rotten tree fern log], Upper Hutt, Kaitoke Waterworks, 22 May 1982, R.H. Petersen ([PDD 46646], isotype TENN).

Clavaria phoenicea Zoll. & Mor. var. ***persicina*** R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 31 & 150, 1988
Pelorus Scenic Reserve, Trig Track, 21 May 1982, R.H. Petersen ([PDD 46647], isotype TENN).

Clavaria plumbeo-argillacea R.H.Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 43 & 151, 1988
[soil under *Cyathea, Leptospermum, Phyllocladus* and *Dacrydioides*], Auckland, Mill Bay, 6 Jul 1981, R.H. Petersen, E. Horak ([PDD 46674], holotype ZT, isotype TENN).

Clavaria pusio M.J. Berkeley in J.D. Hooker, *Flora Novae-Zelandiae 2*: 185, 1855
on the naked soil, W. Colenso [PDD 28079, holotype K].

Clavaria redoleo-alii R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 43 & 152, 1988
soil and humus under mixed *Nothofagus* and podocarp forests, vic. Karamea, Granity Creek Valley, north slope, 9 Jun 1981, R.H. Petersen ([PDD 46670], isotype TENN).

Clavaria roseo-violacea R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 45 & 152, 1988
Auckland, Mill Bay, 29 Jun 1981, P.R. Johnston ([PDD 46675], isotype TENN).

Clavaria subsordida R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 45 & 152, 1988
bare soil at base of Big Kauri Tree, Waipoua Kauri Reserve, Te Matua Ngahere, 23 Jun 1981, R.H. Petersen, A. Hawthorne ([PDD 46672], isotype TENN).

Clavaria subviolacea R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 46 & 152, 1988
soil in 'broad leaf' forest, Waitakere Range, Karamatura Stream, 1 Jul 1981, E. Horak, P.R. Johnston ([PDD 46677], holotype ZH, isotype TENN).

Clavaria tuberculospora R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 46 & 152, 1988
Waipoua Kauri Reserve, vic. Forestry Headquarters, 21 Jun 1981, R.H. Petersen ([PDD 46657], isotype TENN).

Clavaria ypsilonidia R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 47 & 152, 1988
leaf humus and very rotten, soggy wood, Waipoua Kauri Reserve, across river from Forestry Headquarters, 24 Jun 1981, R.H. Petersen ([PDD 46673], isotype TENN).

Clavulina alutaceo-siccescens R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 57 & 153, 1988
vic. Murchison, 6.5 km E of Six-mile Creek, 11 May 1982, R.H. Petersen ([PDD 46634], isotype TENN).

Clavulina brunneo-cinerea R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 57 & 153, 1988
soil or humus under forests, Urewera National Park, Waikare-iti Track, 26 May 1981, R.H. Petersen ([PDD 46660], isotype TENN).

Clavulina copioso-cystidiata R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 59 & 154, 1988
sandy soil under *Leptospermum*, Waipoua Kauri Reserve, near seashore, 25 Jun 1981, G.J. Samuels ([PDD 46662], isotype TENN).

Clavulina cristata (Fr.) Schrot. var. **zealandica** R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 61 & 154, 1988
humus or woody debris under *Nothofagus*, Nelson Lakes National Park, St. Arnaud's Track, 13 May 1982, [R.H. Petersen] ([PDD 46652], isotype TENN).

Clavulina purpurea R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 66 & 155, 1988
[ground under tree fern and in gravelly soil], vic. Murchison, 0.2 km W of Lyell Picnic Area, State Highway 6, 17 Apr 1983, R.H. Petersen ([PDD 46659], isotype TENN).

Clavulina samuelsii R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 67 & 155, 1988
under mixed forest, often with kauri, Waipoua Kauri Reserve, near Forestry Headquarters, 24 Jun 1981, G.J. Samuels ([PDD 46628], isotype TENN). Named for G.J. Samuels, mycologist.

Clavulina septo-cystidiata R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 67 & 155, 1988
under mixed forest with *Nothofagus* dominant, Urewera National Park, Lake Ruapani Track, 25 May 1982, R.H. Petersen ([PDD 46640], isotype TENN).

Clavulina subrugosa (Clel.) Corner var. **tenuis** R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 70 & 155, 1988
under both mixed podocarp and *Nothofagus* forest, Abel Tasman National Park, Coast Track, 16 May 1982, R.H. Petersen, G.J. Samuels ([PDD 46661], isotype TENN).

Clavulina urnigerobasidiata R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 70 & 155, 1988
Auckland, Mill Bay, 3 Jun 1982, G.J. Samuels, R.H. Petersen ([PDD 46643], isotype TENN).

Clavulina vinaceo-cervina (Clel.) Corner var. **avellanea** R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 72 & 155, 1988
under both mixed podocarp and *Nothofagus* forest, Abel Tasman National Park, Coast Track, 16 May 1982, G.J. Samuels ([PDD 46631], isotype TENN).

Coccomyces clavatus P.R. Johnston, *N.Z. Jl Bot. 24*: 91, 1986
on fallen phylloclades of *Phyllocladus aspleniifolius* var. *alpinus*, Otago, Dunedin, Mt Cargill, near summit, 13 May 1984, P.R. Johnston (PDD 45286).

Coccomyces cupressinum P.R. Johnston, *N.Z. Jl Bot. 24*: 97, 1986
on fallen leaves of *Dacrydium cupressinum*, Auckland, Waitakere Ra., Sharp's Bush, 19 Jul 1983, P.R. Johnston (PDD 44633).

Coccomyces globosus P.R. Johnston, *N.Z. Jl Bot. 24*: 99, 1986
on fallen leaves of *Nestegis lanceolata*, Auckland, Waitakere Ra., Walker's Bush Track, 4 Aug 1982, P.R. Johnston, G.J. Samuels, E.H.C. McKenzie (PDD 44643).

Coccomyces lauraceus P.R. Johnston, *N.Z. Jl Bot. 24*: 104, 1986
on fallen leaves of *Beilschmiedia tawa*, Auckland, Waitakere Ra., Nihotupu Dam, 1 Sep 1982, P.R. Johnston (PDD 44654). Host plant family.

Coccomyces libocedri P.R. Johnston, *N.Z. Jl Bot. 24*: 105, 1986
on dead leaves of *Libocedrus bidwillii*, Otago, Dunedin, Mt Cargill, near summit, 14 May 1984, P.R. Johnston (PDD 45275).

Coccomyces longwoodicus P.R. Johnston, *N.Z. Jl Bot. 24*: 110, 1986
on fallen leaves of *Halocarpus biformis*, Southland, Longwood Ra., Longwood S.F., Bald Hill at bushline on summit road, 7 May 1984, P.R. Johnston, J.S. Dugdale, H. Donner (PDD 46699).

Coccomyces phyllocladi P.R. Johnston, *N.Z. Jl Bot. 24*: 111, 1986
on fallen phylloclades of *Phyllocladus sp.*, Westland, Fox Glacier, Gillespies Beach Road, 7 Apr 1983, P.R. Johnston, G.J. Samuels, R.E. Beever, R.H. Petersen (PDD 44674).

Codinaea botulispora S.J. Hughes & W.B. Kendrick, *N.Z. Jl Bot. 6*: 335-6, 1968
on bark of *Nothofagus solandri* var. *cliffortioides*, Wellington Prov., Tongariro National Park, Whakapapanui Track, 5 Mar 1963, S.J. Hughes (PDD 25075, isotype DAOM 96413e).

Codinaea brevisetula S.J. Hughes & W.B. Kendrick, *N.Z. Jl Bot. 6*: 338, 1968
on wood and bark of *Nothofagus fusca*, Wellington Prov., Tongaririo National Park, Ohakune Mountain Road, [2500 ft], 7 Mar 1963, S.J. Hughes (PDD 20652, isotype DAOM 96420a).

Codinaea fertilis S.J. Hughes & W.B. Kendrick, *N.Z. Jl Bot. 6*: 347, 1968
on bases of dead leaves of *Rhopalostylis sapida*, Auckland Prov., Waitakere Range, Waiatarua, [Rangemore Track], 8 May 1963, S.J. Hughes (PDD 20965, isotype DAOM 93548c).

Codinaea longispora S.J. Hughes & W.B. Kendrick, *N.Z. Jl Bot. 6*: 349-50, 1968
on wood of *Knightia excelsa*, North Auckland, Puketi Forest, 20 Jun 1963, S.J. Hughes (PDD 25755, isotype DAOM 97322).

Codinaea obesispora S.J. Hughes & W.B. Kendrick, *N.Z. Jl Bot. 6*: 351-2, 1968
on corticated branches of *Muehlenbeckia australis*, Auckland Prov., Coromandel Penisula, Whangapoua Saddle, 5 Sep 1963, J.M. Dingley (PDD 21494, isotype DAOM 114734a).

Codinaea parva S.J. Hughes & W.B. Kendrick, *N.Z. Jl Bot. 6*: 354, 1968
on bark of *Weinmannia racemosa*, Westland, Pukekura, Lake Ianthe, 8 Apr 1963, S.J. Hughes (PDD 25756, isotype DAOM 93565d).

Codinaea setosa S.J. Hughes & W.B. Kendrick, *N.Z. Jl Bot. 6*: 360-1, 1968
bark, Auckland Prov., Waitakere Range, Waiatarua, [Kauri Knoll Track], 6 Feb 1963, S.J. Hughes (PDD 25758, [isotype DAOM 97327]).

Codinaea simplex S.J. Hughes & W.B. Kendrick, *N.Z. Jl Bot. 6*: 362, 1968
on bark of *Weinmannia racemosa*, Westland, Pukekura, Lake Ianthe, 8 Apr 1963, S.J. Hughes (PDD 25759, isotype DAOM 96020g).

Codinaea vulgaris S.J. Hughes & W.B. Kendrick, *N.Z. Jl Bot. 6*: 367, 1968
on wood & bark of *Nothofagus solandri* var. *cliffortioides*, Wellington Prov., Tongariro National Park, Silica Springs Track, Whakapapanui Stream, 5 Mar 1963, S.J. Hughes (PDD 20594, type DAOM 97315b).

Coleosporium fuchsiae M.C. Cooke, *Grevillea 14*: 129, 1886
Fuchsia excorticata, [Wellington, Haywards Valley, 3 Sep 1881], T. Kirk ([PDD 9798], holotype K).

Colletogloeum nubilosum A. Ganapathi & J.B. Corbin, *Trans. Br. mycol. Soc. 72*: 237, 1979
on leaves of *Eucalyptus delagatensis*, Auckland, [Auckland University], Apr 1977, A. Ganapathi (PDD 37677, isotype IMI 228671). Teleomorph = *Mycosphaerella nubilosa* (Cke) Hansford.

Coltricia cartilaginea G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 164*: 197 & 262, 1965
on decorticated decayed wood, Wellington, Tararua Range, Ohau River, Yeates Track, [Jan 1933, E.E. Chamberlain] (PDD 3869).

Coltricia strigosa G.H. Cunningham, *Bull. Plant Dis. Div. Dep. scient. ind. Res. 77*: 4, 1948
solitary or usually caespitose on rich humus on the floor of forest or scrubland, Auckland, Little Barrier I., [3] Oct 1945, J.M. Dingley [PDD 4417].

Coniophora dimitica G.H. Cunningham, *Trans. R. Soc. N.Z. 84*: 495-6, 1957
effused on bark of dead branches of *Leptospermum scoparium*, Auckland, Rangitoto I., [8] Jun 1947, J.M. Dingley (PDD 5541).

Coniophora minor G.H. Cunningham, *Trans. R. Soc. N.Z. 84*: 494-5, 1957
effused on decorticated wood of *Vitex lucens*, Auckland, Oratia, 600 ft, [18] May 1953, J.M. Dingley (PDD 12549).

Coniothyrium celmisiae H. Sydow, *Ann. Mycol. 22*: 311-2, 1924
on leaves of *Celmisia* sp. [*coriacea*], Westland, Arthur's Pass, 8 Dec 1920, E.H. Atkinson

(PDD 964).

Conoplea novae-zelandiae S.J. Hughes, *N.Z. Jl Bot. 16*: 320-1, 1978
dead wood and bark of *Ackama rosaefolia*, North Auckland, Puketi Forest, 20 Jun 1963, S.J. Hughes (PDD 21257, isotype DAOM 93612).

Conoplea tortuosa S.J. Hughes, *N.Z. Jl Bot. 16*: 323, 1978
on dead bark of *Quintinia serrata*, Westland, Granville Forest, Orwell Creek, Ahaura, 3 Apr 1963, S.J. Hughes (PDD 20739, isotype DAOM 93649).

Coprotus trichosurus A. Bell & J.W. Kimbrough, *Trans. Br. mycol. Soc. 61*: 192, 1973
scattered or gregarious on dung of *Trichosurus vulpecula*, Wellington, Orongorongo Valley, Dec 1971, A. Bell (PDD 30082).

Cordierites acanthophora G.J. Samuels & L.M. Kohn, *Sydowia 39*: 203-4, 1986 (1987)
on ground among moss, Auckland, Waitakere Ranges, Waitemata City, off Scenic Drive, Old Coach Road, 14 Aug 1981, G.J. Samuels, [J.M. Dingley, P.R. Johnston, R.P. Korf] (PDD 46965, isotype CUP).

Cordyceps aemonae C.G. Lloyd, *Mycol. Notes 62*: 932, 1920
on larvae of *Aemona hirta*, [Wellington, Weraroa, 16 Sep 1919, G.H. Cunningham] [PDD 78].

Cordyceps consumpta G.H. Cunningham, *Trans. Proc. N.Z. Inst. 53*: 377, 1921
Porina sp., growing from head, Rotorua, [Jun 1920], A. Lush [PDD 36716].

Cordyceps hauturu J.M. Dingley, *Trans. R. Soc. N.Z. 81*: 334, 1953
Lepidoptera larva [*Oxycanus* sp.], Auckland, Little Barrier I., [2] Oct 1945, J.M. Dingley (PDD 10676). Maori name for Little Barrier I.

Cordyceps kirkii G.H. Cunningham, *Trans. Br. mycol. Soc. 8*: 75, 1923
male and female imagines of *Deinacrida rugosa*, Cook Strait, Stephen Island, Jan 1922, H.B. Kirk [PDD 10607]. Named for collector, Prof. H.B. Kirk, New Zealand biologist.

Cordyceps lateritia J.M. Dingley, *Trans. R. Soc. N.Z. 81*: 337, 1953
on Coleoptera pupa [on *Rhopalostylis sapida*], Auckland, Waitakere Ra., Swanson, Jul [Jun] 1949, [J.M. Dingley] (PDD 11717).

Cordyceps novae-zelandiae J.M. Dingley, *Trans. R. Soc. N.Z. 81*: 337-8, 1953
on adult of *Coelostomidea* sp., Otago, Upper Hollyford Valley, [8] Jan 1950, J.M. Dingley (PDD 10674).

Coremium gracile T.H. MacBride, *Mycologia 18*: 131, 1926
[*Podocarpus spicatus*, Wellington, Weraroa, Aug 1919, G.H. Cunningham] [PDD 1129].

Corticium afibulatum G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 296, 1954
effused on bark of dead trunks of *Corynocarpus laevigata*, Auckland, Whitianga, Buffalo Beach, [19] Nov 1947, E.E. Chamberlain (PDD 7421).

Corticium ampullosporum G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 306-7, 1954
scattered as small colonies usually on bark of living trunks or branches of *Metrosideros robusta*, Auckland, Piha, White's Stream, Jan 1951, J.M. Dingley (PDD 11428).

Corticium bullatum G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 314, 1954
effused on bark or decorticated decaying wood of *Leptospermum ericoides*, Auckland, Hunua Falls, [1] Oct 1946, G.H. Cunningham (PDD 4702).

Corticium coprosmae G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 280-1, 1954
effused on bark of dead branches of *Coprosma australis*, Auckland, Waitakeres, off Anawhata Road, [3] Jun 1946, J.M. Dingley (PDD 4528).

Corticium cordylines G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 323-4, 1954
effused on bark of dead stems of *Cordyline australis*, Auckland, [Three Kings], South-west King I., [10] Jan 1950, G.T.S. Baylis (PDD 7405).

Corticium corniculatum G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 317, 1954
effused over bark of dead branches of *Leptospermum ericoides*, Auckland, Northcote, Kauri Glen, [25] Aug 1951, J.M. Dingley (PDD 11339).

Corticium corrosum G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 286-8, 1954
effused on decorticated wood of *Neopanax colensoi*, Auckland, Mt Hauhangatahi, 2,800 ft,

Feb 1952, G.H. Cunningham (PDD 11350).

Corticium corymbatum G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 324, 1954
effused on decorticated decaying wood of *Brachyglottis repanda*, Auckland, Hick's Bay, 300 ft, [22] May 1952, G.H. Cunningham (PDD 11474).

Corticium crystallitectum G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 296-8, 1954
effused on bark of dead branches and stems of *Nothopanax arboreum*, Auckland, Glen Esk Valley, Piha, [12] May 1951, J.M. Dingley (PDD 11240).

Corticium fallax G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 309-10, 1954
effused on decorticated decaying wood of *Beilschmiedia tawa*, Auckland, Lake Rotoehu, 1200 ft, [24] May 1952, G.H. Cunningham (PDD 11475).

Corticium fistulatum G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 292, 1954
effused on dead bark or decorticated wood of *Leptospermum scoparium*, Auckland, Birkenhead, Kauri Park, [7] Jul 1946, J.M. Dingley (PDD 4562).

Corticium flagellatum G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 145*: 52 & 330, 1963
effused on decorticated decayed wood of *Nothofagus menziesii*, Otago, Alton Valley, Tuatapere, 120 m, [24 Feb 1954, J.M. Dingley] (PDD 17418).

Corticium glaucocanum G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 145*: 94 & 330, 1963
effused on decayed decorticated wood of *Melicytus ramiflorus*, Wellington, Totara Reserve, Pohangina Valley, 100 m, [12 Jan 1954, G.H. Cunningham] (PDD 17429).

Corticium globososporum G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 285, 1954
effused on decorticated wood of *Dacrydium cupressinum*, Auckland, Glen Esk Valley, Piha, [12] May 1951, J.M. Dingley (PDD 11273).

Corticium griseliniae G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 145*: 71 & 330, 1963
effused on decorticated decayed wood of branches of *Griselinia lucida*, Wellington, Mt Tongariro, 900 m, [14 Jan 1955, G.H. Cunningham] (PDD 17424).

Corticium kauri G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 303-4, 1954
adnate on much decayed decorticated wood of *Agathis australis*, Auckland, Huia, Jul 1947, J.M. Dingley (PDD 5568). Maori name for host plant.

Corticium leptospermi G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 312-3, 1954
effused on dead standing decorticated trunks of *Leptospermum ericoides*, Auckland, Kaimanawa Ranges, 2500 ft, Mar 1952, G.H. Cunningham (PDD 11427).

Corticium lianacolum G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 145*: 66 & 331, 1963
on living bark of *Metrosideros fulgens*, Wellington, Upper Pohangina Valley, 200 m, [8 Jan 1956, G.H. Cunningham] (PDD 17437).

Corticium luteo-aurantiacum E.M. Wakefield, *Bull. misc. Inf. R. bot. Gdns Kew 1915*: 372, 1915
on wood, near Rotorua, Mamaku, 1914, W.N. Cheeseman [PDD 17455].

Corticium otagense G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 145*: 64 & 331, 1963
effused on bark of dead branches of *Griselinia littoralis*, Otago, Stewart I., Horseshoe Bay, 20 m, [17 Feb 1954, J.M. Dingley] (PDD 17421).

Corticium patricium G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 289-90, 1954
effused on bark of dead branches of *Nothofagus cliffortioides*, Auckland, Mt Ruapehu, Whakapapa, 3000 ft, [20] Oct 1949, J.M. Dingley (PDD 11220).

Corticium perenne G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 288-9, 1954
effused on decorticated wood of *Dacrydium cupressinum*, Auckland, Titirangi beach, [26] Oct 1946, J.M. Dingley (PDD 4761).

Corticium pteridophilum G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 145*: 66-7 &

331, 1963
on pendent dead stipes of *Cyathea dealbata*, Auckland, Thames, Kauaeranga Valley, 50 m, [26 Aug 1954, S.D. Baker] (PDD 17427).

Corticium rhabarbarinum M.J. Berkeley in J.D. Hooker, *Flora Novae-Zelandiae 2*: 184, 1855
on bark, [Auckland, Otawa], W. Colenso [PDD 35798, holotype K].

Corticium singulare G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 325, 1954
effused on bark and decorticated decaying wood of *Litsea calicaris*, Auckland, [Rotorua], Waiotapu, [17] Jun 1950, J.M. Dingley (PDD 10589).

Corticium torquatum G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 283, 1954
effused on decorticated decaying wood of *Dysoxylum spectabile*, Auckland, Coromandel coast, Dec 1946, J.M. Dingley (PDD 5035).

Corticium umbonatum G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 298-9, 1954
effused on bark of dead stems of *Bambusa* sp. [*Arundinaria macrosperma*], Auckland, Mt Eden, 350 ft, Mar 1950, G.H. Cunningham (PDD 10596).

Corticium utriculicum G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 283-4, 1954
effused on bark of decaying branches of *Rhipogonum scandens*, Auckland, [Rotorua], Lake Okataina, 1500 ft, [26] Jun 1952, G.H. Cunningham (PDD 11505).

Corticium vallum G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 145*: 62 & 331, 1963
effused on decorticated dead wood of *Griselinia littoralis*, Wellington, Whakapapa, Mt Ruapehu, 1000 m, [20 Oct 1949, J.M. Dingley] (PDD 11216).

Corticium variicolor G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 145*: 67-8 & 331, 1963
effused on bark of decorticated dead wood of *Coprosma australis*, Taranaki, Mt Egmont, 850 m, [26 Mar 1951, J.M. Dingley] (PDD 17415).

Corticium viride M.J. Berkeley in J.D. Hooker, *Flora Novae-Zelandiae 2*: 184, 1855
on dead decorticated wood, and also on bark, North Island, W. Colenso ([PDD 35806], holotype K).

Corticium vitellinum G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 313-4, 1954
effused on bark of dead standing saplings and stems of *Nothofagus cliffortioides*, Auckland, Kaimanawa Ranges, 2300 ft, Mar 1952, G.H. Cunningham (PDD 11424).

Cortinarius aegrotus E. Horak, *Sydowia 42*: 158, 1990
on soil under *Nothofagus fusca* and *N. menziesii*, Gisborne, Urewera National Park, trail to Lake Waikareiti, 25 May 1981, E. Horak (PDD 27270, isotype ZT 776).

Cortinarius aerugineoconicus E. Horak, *Sydowia 42*: 105, 1990
on soil among litter under *Nothofagus menziesii, N. fusca, N. solandri* var. *cliffortioides*, Nelson, Takaka Hills, Mt Evans, 3 May 1969, E. Horak (PDD 27258, isotype ZT 69/284).

Cortinarius bellus E. Horak, *Sydowia 42*: 125, 1990
on soil among litter under *Nothofagus fusca* and *N. menziesii*, Gisborne, Urewera National Park, near Headquarters, 30 May 1981, E. Horak (PDD 27260, isotype ZT 842).

Cortinarius castaneiceps E. Horak, *Sydowia 42*: 156, 1990
on soil under *Leptospermum* spp. and *Nothofagus truncata*, Hauraki Gulf, Little Barrier I., Summit Track, 15 Jun 1981, E. Horak (PDD 27269, isotype ZT 954).

Cortinarius cucumeris E. Horak, *Sydowia 42*: 129, 1990
on soil under *Nothofagus fusca, N. menziesii, Fuchsia* and *Dicksonia*, Gisborne, Urewera National Park, trail to Lake Waikareiti, 25 Jun 1968, E. Horak (PDD 27261, isotype ZT 68/603).

Cortinarius cycneus E. Horak, *Sydowia 42*: 94, 1990
on soil under *Leptospermum scoparium*, Nelson, Lake Rotoiti, Tophouse Saddle, 1 May 1968, E. Horak (PDD 27254, isotype ZT 68/330).

Cortinarius gemmeus E. Horak, *Sydowia 42*: 155, 1990
on soil under *Leptospermum* spp., Hauraki Gulf, Little Barrier I., Tirikawa Stream, 14 Jun 1981, E. Horak (PDD 27268, isotype ZT 943).

Cortinarius ignotus E. Horak, *Sydowia 42*: 142, 1990
on soil among litter of *Leptospermum* sp., North Auckland, Hauraki Gulf, Little Barrier I., Tirikawa Stream, 14 Jun 1981, E. Horak (PDD 27264, isotype ZT 945).

Cortinarius indolicus E. Horak, *Sydowia 42*: 96, 1990
on soil under *Nothofagus fusca* and *N. menziesii*, Gisborne, Urewera National Park, Lake Waikareiti, 25 Jun 1968, E. Horak (PDD 27256, isotype ZT 68/600).

Cortinarius marmoratus E. Horak, *Sydowia 42*: 131, 1990
on soil under *Nothofagus solandri* var. *cliffortioides* and *Leptospermum scoparium*, Nelson, Lake Rotoiti, trail to Mt Robert, 3 May 1968, E. Horak (PDD 27262, isotype ZT 68/362).

Cortinarius melimyxa E. Horak, *Sydowia 42*: 151, 1990
on soil under *Nothofagus solandri* var. *cliffortioides, N. menziesii, Leptospermum scoparium*, Nelson, Tophouse Saddle, Big Bush, 4 May 1969, E. Horak (PDD 27267, isotype ZT 69/289).

Cortinarius olorinatus E. Horak, *Sydowia 42*: 92, 1990
on soil in pure *Leptospermum scoparium* forest, North Auckland, Warkworth, The Dome, 5 Jun 1981, E. Horak (PDD 27255, isotype ZT 877).

Cortinarius phaeochlorus E. Horak, *Sydowia 42*: 148, 1990
on soil under *Leptospermum scoparium* and *L. ericoides*, North Auckland, Waitakere Range, Anaw[h]ata Road, 7 Jun 1981, E. Horak (PDD 27265, isotype ZT 895).

Cortinarius porphyrophaeus E. Horak, *Sydowia 42*: 137, 1990
on soil under *Leptospermum scoparium* and *L. ericoides*, North Auckland, Hauraki Gulf, Little Barrier I., Tirikawa Stream, 14 Jun 1981, E. Horak (PDD 27263, isotype ZT 942).

Cortinarius taylorianus E. Horak, *Sydowia 42*: 122, 1990
on soil under *Nothofagus fusca, N. menziesii, N. solandri* var. *cliffortioides*, Nelson, Lake Rotoiti, eastern shore, 30 Apr 1968, E. Horak (PDD 27259, isotype ZT 68/327). Named for G.M. Taylor, New Zealand mycologist.

Cortinarius viscostriatus E. Horak, *Sydowia 42*: 163-4, 1990
on soil under *Nothofagus fusca* and *N. menziesii*, Nelson, Lake Rotoiti, track to St. Arnaud Range, 23 May 1968, E. Horak (PDD 27272, isotype ZT 68/505).

Cortinarius viscoviridis E. Horak, *Sydowia 42*: 103, 1990
on ground among moss and litter under *Nothofagus solandri* var. *cliffortioides, N. menziesii* and *Leptospermum scoparium*, Nelson, Lake Rotoiti, trail to St. Arnaud Range, 30 Apr 1969, E. Horak (PDD 27257, isotype ZT 69/275).

Cortinarius vitreopileatus E. Horak, *Sydowia 42*: 160, 1990
on soil under *Nothofagus fusca* and *N. menziesii*, Gisborne, Urewera National Park, Black Beech Track, 23 May 1981, E. Horak (PDD 27271, isotype ZT 756).

Crepidotus nanicus E. Horak, *Ber. Schweiz. Bot. Ges. 87*: 232, 1977
on rotten wood of *Nothofagus menziesii*, Fjordland [Fiordland], Lake Te Anau, track to Mt Luxmore, 9 Apr 1969, E. Horak (PDD 27136, isotype ZT 69/328).

Crepidotus parietalis E. Horak, *Ber. Schweiz. Bot. Ges. 87*: 232-4, 1977
on rotting leaves of *Freycinetia*, Westland, Hari Hari, Big Wanganui, 18 Feb 1969, E. Horak (PDD 27137, isotype ZT 69/94).

Crocicreas hierachifolium P.R. Johnston, *Mem. N.Y. bot. Gdn 49*: 108, 1989
on leaf tomentum of *Celmisia hierachifolia*, Wellington, Tararua Ra., Pukemoremore Summit, 10 Feb 1985, P.R. Johnston (PDD 49098).

Crocicreas ilicifolium P.R. Johnston, *Mem. N.Y. bot. Gdn 49*: 109-110, 1989
amongst leaf tomentum of *Olearia ilicifolia*, Wellington, Tararua Ra., stream north of Dundas Hut, 14 Feb 1985, P.R. Johnston (PDD 49101).

Crocicreas macrostipitatum P.R. Johnston, *Mem. N.Y. bot. Gdn 49*: 110-11, 1989
amongst leaf tomentum of *Celmisia spectabilis*, Wellington, Tararua Ra., vic. Dundas Hut, 11 Feb 1985, P.R. Johnston (PDD 49103).

Crucellisporiopsis gelatinosus T.R. Nag Raj, *Can. J. Bot. 60*: 2605, 1982
on decaying leaves of *Weinmannia racemosa*, Westland, Haast Pass, 31 Mar 1980, W.B.

Kendrick (PDD 41405).

Crucibulum simile G. Massee, *Grevillea 19*: 94, 1891
on bark and wood, [W. Colenso] [PDD 8507, holotype K.

Crucispora naucorioides E. Horak, *N.Z. Jl Bot. 9*: 489, 1971
on soil under *Cyathea dealbata, C. smithii, Phyllocladus trichomanoides,* and *Leptospermum ericoides*, Coromandel Peninsula, Kauaeranga Valley, 5 Jul 1968, E. Horak (PDD 27001, isotype ZT 68/641).

Cryptohymenium pycnidiophorum G.J. Samuels & L.M. Kohn, *Sydowia 39*: 206-8, 1986 (1987)
on soil among mosses, Gisborne, Urewera National Park, Lake Waikaremoana, Waikare-iti track, 24 May 1981, G.J. Samuels, [A.P. Hawthorne, E. Horak, P.R. Johnston, R.H. Petersen] (PDD 46964).

Cuphocybe pha[e]omyxa E. Horak, *Beih. Nova Hedwigia 43*: 198, 1973
amongst litter under *Nothofagus fusca* and *N. menziesii*, Prov. Nelson, Tophouse Saddle, 5 May 1969, E. Horak (PDD 27071, isotype ZT 69/297).

Cylindrocarpon austrodestructans D. Brayford & G.J. Samuels in Samuels & Brayford, *Mycol. Res. 94*: 441, 1990
on bark of indet. tree, Westland, Westland Natl. Park, vic. Franz Josef, track to Lake Wombat, 10 Apr 1983, G.J. Samuels, R.E. Petersen (PDD 46395). Teleomorph = *Nectria austroradicicola* Samuels & Brayford.

Cyphella discoidea M.C. Cooke, *Grevillea 12*: 85, 1884
on hawkweed, [Napier], W. Colenso b30 [PDD 39270, holotype K]. Spider egg-cases, fide G.H. Cunningham.

Cyphella hebe G.H. Cunningham, *Trans. R. Soc. N.Z. 81*: 181, 1953
solitary on bark of dead twigs of *Hebe salicifolia*, Taranaki, Mt Egmont, 4000 ft, [20] Apr 1946, J.M. Dingley [PDD 11167].

Cyphella pseudopanax G.H. Cunningham, *Trans. R. Soc. N.Z. 81*: 186-7, 1953
scattered on bark of dead stems of *Pseudopanax crassifolium*, Taranaki, Mt Egmont, 2700 ft, Feb 1952, G.H. Cunningham [PDD 11452].

Cyphella pyriforma G.H. Cunningham, *Trans. R. Soc. N.Z. 81*: 184-5, 1953
scattered on bark of dead twigs of *Hebe salicifolia*, Taranaki, Mt Egmont, 3500 ft, Apr 1946, J.M. Dingley [PDD 7134].

Cyphella tongariro G.H. Cunningham, *Trans. R. Soc. N.Z. 81*: 185-6, 1953
scattered on bark of dead twigs of *Phyllocladus trichomanoides*, Auckland, Mt Tongariro, 2500 ft, Mar 1952, G.H. Cunningham [PDD 11453].

Cyphella totara G.H. Cunningham, *Trans. R. Soc. N.Z. 81*: 182-3, 1953
scattered on bark of living and dead branches of *Podocarpus totara*, Canterbury, Peel Forest, 1800 ft, Jan 1928, G.H. Cunningham [PDD 3349].

Cyphella turbinata G.H. Cunningham, *Trans. R. Soc. N.Z. 81*: 185, 1953
scattered on bark of dead twigs of *Olearia paniculata*, Otago, Invercargill, Oct 1950, W. Faithful [PDD 7917].

Cyttaria nigra G.B. Rawlings, *Trans. R. Soc. N.Z. 84*: 26, 1956
obligate parasite on *Nothofagus menziesii* causing large globose galls, [Southland], Woodlaw State Forest, Oct 1946, [PDD 43105, holotype NZFRI].

Cyttaria pallida G.B. Rawlings, *Trans. R. Soc. N.Z. 84*: 27, 1956
obligate parasite on *Nothofagus menziesii* causing large spindle shaped galls, [Southland], Woodlaw State Forest, Oct 1946, [PDD 43106, holotype NZFRI].

Dacrymyces novae-zelandiae R.F.R. McNabb, *N.Z. Jl Bot. 11*: 493-5, 1973
on wood of *Melicytus ramiflorus*, Auckland Province, Huia, [29] Nov 1952, J.M. Dingley (PDD 25556, isotype K).

Dasyscyphus apiculatus R.W.G. Dennis, *Kew Bull. 15*: 295-6, 1962
on wood of *Nothofagus fusca*, Lake Waik[a]remoana, Auckland district, 600 m, 29 Dec [Nov]

1955, J.M. Dingley (PDD 18987).

Dasyscyphus emerici (Berk. & Phil.) Sacc. var. ***nothofagi*** R.W.G. Dennis, *Kew Bull. 15*: 298, 1962

on bark of *Nothofagus menziesii*, Otago, Milford, Feb 1948, J.M. Dingley (PDD 18986).

Dasyscyphus melanophthalmus R.W.G. Dennis, *Kew Bull. 15*: 299, 1962

Nothofagus sp., Wellington, Tararua Ranges, Apr 1950 (PDD 18981).

Dasyscyphus pteridicola R.W.G. Dennis, *Kew Bull. 15*: 299-300, 1962

on dead petiole of *Cyathea dealbata*, Auckland, Waitakere Ranges, Waiatarua, Nov 1948, J.M. Dingley (PDD 18980).

Dasyscyphus triseptatus R.W.G. Dennis, *Kew Bull. 15*: 300-1, 1962

on wood of *Schefflera digitata*, Westland, Waiko, [base of Alec's Knob Track], 5 Nov 1954, J.M. Dingley (PDD 18985).

Dermocybe alienata E. Horak, *Sydowia 40*: 103-4, 1987 (1988)

on soil under *Leptospermum ericoides* (with *Vitex, Rhopalostylis, Knightia*), Auckland, Waitakere Range, Piha Valley, 2 Jun 1969, E. Horak (PDD 27180, isotype ZT 69/372).

Dermocybe aurantiella E. Horak, *Sydowia 40*: 95-6, 1987 (1988)

on soil under *Nothofagus menziesii*, Fiordland, Milford Sound, W of Homer Tunnel, 1 Apr 1969, E. Horak (PDD 27176, isotype ZT 69/203).

Dermocybe canaria E. Horak, *Sydowia 40*: 93-4, 1987 (1988)

on soil under *Nothofagus solandri* var. *cliffortioides* (in *Sphagnum* swamp), Nelson, Tophouse Saddle, 3 Mar 1968, E. Horak (PDD 27175, isotype ZT 68/98).

Dermocybe cardinalis E. Horak, *Sydowia 40*: 89-90, 1987 (1988)

on soil under *Nothofagus menziesii-fusca*, Nelson, Lake Rotoiti, track to St. Arnaud Range, 5 May 1968, E. Horak (PDD 27174, isotype ZT 68/373).

Dermocybe castaneodisca E. Horak, *Sydowia 40*: 99-101, 1987 (1988)

on soil under *Nothofagus fusca*, Westland, Ngahere, Lake Haupiri, Kopara, 13 Dec 1967, E. Horak (PDD 27178, isotype ZT 67/249).

Dermocybe cramesina E. Horak, *Sydowia 40*: 87-8, 1987 (1988)

on soil under *Nothofagus fusca-menziesii*, Nelson, Lake Rotoiti, trail to St. Arnaud Range, 30 Apr 1968, E. Horak (PDD 27173, isotype ZT 68/321).

Dermocybe egmontiana E. Horak, *Sydowia 40*: 97, 1987 (1988)

on soil under *Leptospermum scoparium*, Taranaki, Mt Egmont N. P., near Dawson Falls, 19 Jun 1968, E. Horak (PDD 27177, isotype ZT 68/572).

Dermocybe icterinoides E. Horak, *Sydowia 40*: 110-2, 1987 (1988)

on soil under *Nothofagus menziesii-fusca* (with *Phyllocladus, Dracophyllum*), Gisborne, Urewera N. P., Lake Waikareiti, 30 Jun 1968, E. Horak (PDD 27184, isotype ZT 68/628).

Dermocybe indotata E. Horak, *Sydowia 40*: 107-8, 1987 (1988)

on soil under *Leptospermum scoparium - Nothofagus solandri* var. *cliffortioides*, Nelson, Lake Rotoiti, Westbay, 29 Apr 1968, E. Horak (PDD 27182, isotype ZT 68/310).

Dermocybe largofulgens E. Horak, *Sydowia 40*: 105-6, 1987 (1988)

on soil under *Leptospermum ericoides*, North Auckland, Waitakere Range, Titirangi, 1 Jun 1969, E. Horak (PDD 27181, isotype ZT 69/371).

Dermocybe leptospermarum E. Horak, *Sydowia 40*: 108-10, 1987 (1988)

on soil under *Leptospermum scoparium* and *Nothofagus solandri* var. *cliffortioides*, Southland, Lake Te Anau, trail to Lake Manapouri, 6 Apr 1969, E. Horak (PDD 27183, isotype ZT 69/232).

Dermocybe olivaceonigra E. Horak, *Sydowia 40*: 101-2, 1987 (1988)

on soil under *Nothofagus fusca-menziesii-solandri* var. *cliffortioides*, Nelson, Lake Rotoiti, track to St. Arnaud Range, 30 Apr 1968, E. Horak (PDD 27179, isotype ZT 68/322).

Dermocybe purpurata E. Horak & Keller in Horak, *Sydowia 40*: 83-5, 1987 (1988)

among *Sphagnum*/rotten wood under *Nothofagus solandri* var. *cliffortioides*, Nelson, Tophouse Saddle, 3 Mar 1968, E. Horak (PDD 27171, isotype ZT 68/100).

Dermocybe splendida E. Horak, *Aust. J. Bot. Suppl. Series 10*: 33, 1983
in *Leptospermum* forest, E. Horak (PDD 27168).

Dermocybe vinicolor E. Horak, *Sydowia 40*: 85-7, 1987 (1988)
on soil under *Nothofagus fusca-menziesii*, Gisborne, Urewera N. P., Black Beech Track, 23 May 1981, E. Horak (PDD 27172, isotype ZT 647).

Descolea majestatica E. Horak, *Persoonia 6*: 239, 1971
in litter under *Nothofagus fusca* and *N. menziesii*, Prov. Nelson, St. Arnaud Range, Lake Rotoiti, 30 Apr 1969, E. Horak (PDD 27006, holotype ZT 69/277).

Descolea phlebophora E. Horak, *Persoonia 6*: 243-4, 1971
among litter, mainly in *Nothofagus* forests (*N. cliffortioides, N. fusca, N. menziesii,* occasionally mixed with species of *Leptospermum*), Prov. Nelson, Lake Rotoiti, St. Arnaud, 30 Apr 1969, E. Horak (PDD 27009, isotype ZT 69/274).

Dingleya verrucosa J.M. Trappe, *Mycotaxon 9*: 331-2, 1979
[in soil under *Leptospermum scoparium*], Auckland District, Waima, Hokianga, 21 Sep 1966, R.A. Cumber (PDD 29712, isotype OSC).

Discinella confusa R.W.G. Dennis, *Kew Bull. 15*: 314, 1962
[beech litter], Westland, Ahaura, Orwel Creek, 26 Apr 1956 [1955], J.M. Dingley (PDD 19036).

Disciseda verrucosa G.H. Cunningham, *Trans. Proc. N.Z. Inst. 57*: 205, 1926
solitary on the ground, hypogaean, Otago, Milford Track, [7] Jan 1920, E.H. Atkinson [PDD 8593].

Discosiella novae-zelandiae T.R. Nag Raj, *Can. J. Bot. 59*: 2528-31, 1981
on leaves of *Beilschmiedia taraire*, Papakura, Kirk's Bush, 20 Dec 1973, W.B. Kendrick (PDD 40205).

Drechslera nobleae E.H.C. McKenzie & D. Matthews, *Trans. Br. mycol. Soc. 68*: 309, 1977
on seeds of *Lolium* (*multiflorum* x *perenne*) 'Grasslands Manawa', 1975, E.H.C. McKenzie (PDD 34672, isotype IMI 202601). Named for M. Noble's contributions to seed pathology.

Duportella fusispora G.H. Cunningham, *Trans. R. Soc. N.Z. 85*: 94-6, 1957
effused on bark of dead standing trunks of *Phyllocladus trichomanoides*, Wellington, Mt Tongariro, Oturere River, 3800 ft, Dec 1946, G.H. Cunningham (PDD 4981).

Duportella monomitica G.H. Cunningham, *Trans. R. Soc. N.Z. 85*: 98-9, 1957
on bark of dead standing stems and trunks of *Leptospermum scoparium*, Auckland, Mt Te Aroha, 1100 ft, [18] Oct 1956, G.H. Cunningham (PDD 16644).

Duportella sphaerospora G.H. Cunningham, *Trans. R. Soc. N.Z. 85*: 96-7, 1957
effused on bark of dead trunks and branches of *Nothofagus menziesii*, Auckland, Kaimanawas, Upper Mohaka River, 2000 ft, [31] May 1953, J.M. Dingley (PDD 12572).

Eichleriella hoheriae R.F.R. McNabb, *N.Z. Jl Bot. 7*: 256, 1969
on dead *Hoheria populnea*, Auckland, Waitakere Ranges, Rangemore Track, 7 Jul 1957, J.M. Dingley (PDD 25012).

Eichleriella subleucophaea R.F.R. McNabb, *N.Z. Jl Bot. 7*: 254, 1969
on dead *Nothofagus menziesii*, Hawke's Bay, Upper Mohaka River, 31 May 1953, J.M. Dingley (PDD 12567).

Elateromyces niger G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 416-7, 1924
in panicles of *Carex dipsacea*, Wellington, Pencarrow, sea-coast, 10 Feb 1921, E.H. Atkinson (PDD 311).

Embellisia leptinellae E. Simmons & C.F. Hill in E.G. Simmons, *Mycotaxon 38*: 254-6, 1990
Leptinella dioica, [Auckland], Papakura, Jul 1989, C.F. Hill (PDD 57920, holotype BPI, isotype IMI, NY).

Embellisia novae-zelandiae E. Simmons & C.F. Hill in E.G. Simmons, *Mycotaxon 38*: 252, 1990
Leptinella dioica, [Auckland], Papakura, Jul 1989, C.F. Hill (PDD 57919, holotype BPI, isotypes IMI, NY).

Endophragmiella dingleyae S.J. Hughes, *N.Z. Jl Bot. 16*: 328, 1978 on rotten wood, Canterbury Prov., Peel Forest, 16 Oct 1963, S.J. Hughes (PDD 30423, isotype DAOM 93909).

Endophragmiella hymenochaeticola S.J. Hughes, *N.Z. Jl Bot. 16*: 329, 1978
on basidiocarps of *Hymenochaete mougeotii* on *Leptospermum scoparium*, Auckland Prov., Cornwallis, 3 Jan 1963, S.J. Hughes (PDD 20415, isotype DAOM 159751).

Endophragmiella novae-zelandiae S.J. Hughes, *N.Z. Jl Bot. 16*: 330, 1978
on dead wood and bark, Auckland Prov., Waitakere Range, Waiatarua, [Rangemore Track], 15 Feb 1963, S. Davison (PDD 30416, isotype DAOM 109676).

Endophragmiella tripartita S.J. Hughes, *N.Z. Jl Bot. 17*: 154, 1979
on decaying wood of *Agathis australis*, Auckland Prov., Orere, 20 Feb 1963, J.M. Dingley (PDD 36097, isotype DAOM 94146).

****Endoscypha perforans*** H. Sydow, *Ann. Mycol. 22*: 306-7, 1924
on leaves of *Dracophyllum traversii*, Westland, Mt Rolleston, 14 Dec 1920, E.H. Atkinson (PDD 1022).

Entoloma aberrans E. Horak, *Beih. Nova Hedwigia 43*: 24-6, 1973
on soil among mosses in *Nothofagus*-forests (with *Dacrydium cupressinum, Podocarpus hallii, P. ferrugineus*), Prov. Westcoast, South of Lake Hochstetter, 17 Mar 1968, E. Horak (PDD 27019, isotype ZT 68/176).

Entoloma acuticystidiosum E. Horak, *Beih. Nova Hedwigia 43*: 17-9, 1973
on soil in forests (under *Dacrydium, Beilschmi[e]dia, Elaeocarpus, Dicksonia,* etc.), Urewera N.P., Lake Waikaremoana, Tawa Track, 24 Jun 1968, E. Horak (PDD 27015, isotype ZT 68/581).

Entoloma aromaticum E. Horak, *Beih. Nova Hedwigia 43*: 52-3, 1973
on soil in forests, Westcoast, Ngahere Prov., S. of Ahaura, 14 Mar 1968, E. Horak (PDD 27038, isotype ZT 68/153).

Entoloma aromaticum Horak f. ***minima*** E. Horak, *Beih. Nova Hedwigia 43*: 54, 1973
on soil or rotten wood in forests (under *Dacrydium cupressinum, Podocarpus* spp., *Metrosideros* spp.), Stewart I., X-mas [Christmas] Village, 13 Mar 1969, E. Horak (PDD 27039, isotype ZT 69/131).

Entoloma atrellum E. Horak, *Beih. Nova Hedwigia 43*: 65-7, 1973
between mosses on bark of living *Dacrydium cupressinum*, Prov. Westcoast, Ngahere, Red Jack Valley, 21 Mar 1968, E. Horak (PDD 27048, isotype ZT 68/203).

Entoloma brunneolilacinum E. Horak, *Beih. Nova Hedwigia 43*: 35-7, 1973
on soil in forests (under *Nothofagus menziesii, Leptospermum scoparium*), Fjordland [Fiordland] N.P., Lake Te Anau, Middle Fjord [Fiord], Doon River, 3 Apr 1969, E. Horak (PDD 27026, isotype ZT 69/222).

Entoloma caesiomarginatum E. Horak, *Beih. Nova Hedwigia 43*: 70, 1973
on soil in forests (under *Nothofagus* spp., and *Leptospermum* spp.), Fjordland [Fiordland] N.P., Lake Te Anau, Middle Fjord [Fiord], Doon River, 3 Apr 1969, E. Horak (PDD 27051, isotype ZT 69/221).

Entoloma canoconicum E. Horak, *Sydowia 28*: 216, 1975 (1976)
on soil under *Leptospermum ericoides* [*scoparium*], Auckland, Piha, Kitekite Falls, 17 May 1971, J.M. Dingley (PDD 29508).

Entoloma cavipes E. Horak, *Beih. Nova Hedwigia 43*: 73-5, 1973
on soil in forests (under *Dacrydium cupressinum* spp., *Weinmannia racemosa*), Stewart I., Paterson Inlet, Ulva I., 23 Mar 1969, E. Horak (PDD 27054, isotype ZT 69/162).

Entoloma cerinum E. Horak, *Beih. Nova Hedwigia 43*: 23-4, 1973
on soil among mosses & litter in *Nothofagus* forests (with *Phyllocladus alpinus, Drachophyllum* spp., etc.), Urewera N.P., S of Lake Waikareiti, 30 Jun 1968, E. Horak (PDD 27018, isotype ZT 68/629).

Entoloma corneum E. Horak, *Beih. Nova Hedwigia 43*: 41-3, 1973
on soil in forests (under *Pittosporum* spp., *Knightia excelsa, Cyathea* spp.), Coromandel

Peninsula, Kauaeranga Valley, 9 Jul 1968, E. Horak (PDD 27030, isotype ZT 68/656).

Entoloma crinitum E. Horak, *Beih. Nova Hedwigia 43*: 30-1, 1973
among mosses on soil (margin of *Nothofagus cliffortioides* - forests), Prov. Southland, Te Anau Downs, near Denton River, 1 Apr 1969, E. Horak (PDD 27022, isotype ZT 69/202).

Entoloma croceum E. Horak, *Beih. Nova Hedwigia 65*: 101-2, 1980
on soil (under *Leptospermum scoparium* and *L. ericoides*), Auckland, Titirangi, Clarke's Bush, 6 May 1971, [B.S. Parris] (PDD 30267).

Entoloma cucurbita E. Horak, *Beih. Nova Hedwigia 43*: 47-8, 1973
on soil in forests (under *Weinmannia, Dacrydium cupressinum, Metrosideros* sp.), Stewart I., S of X-mas [Christmas] Village, 13 Mar 1969, E. Horak (PDD 27033, isotype ZT 69/128).

Entoloma deceptivum E. Horak, *Beih. Nova Hedwigia 43*: 78-80, 1973
on soil in forests (under *Metrosideros umbellata, Nothofagus* spp.), Prov. Nelson, Whanganui Inlet, Kaihoka Reserve, 10 May 1968, E. Horak (PDD 27057, isotype ZT 68/412).

Entoloma decolorans E. Horak, *Beih. Nova Hedwigia 43*: 65, 1973
on soil in forests (under *Nothofagus* spp., *Podocarpus* spp., *Dacrydium cupressinum*), Prov. Westcoast, Ngahere, Ahaura, 15 Mar 1968, E. Horak (PDD 27049, isotype ZT 68/167).

Entoloma farinolens E. Horak, *Beih. Nova Hedwigia 43*: 11, 1973
on rotten tree fern (*Dicksonia fibrosa*), Urewera N.P., Lake Waikaremoana, Tawa Track, 23 Jun 1968, E. Horak (PDD 27011, isotype ZT 68/576).

Entoloma flavum E. Horak (non *E. flavum* Johns., 1878), *Beih. Nova Hedwigia 43*: 61-2, 1973
on soil under shrubs in forests, New Plymouth, Pukekura Park, 10 Jun 1968, E. Horak (PDD 27045, isotype ZT 68/512). Nom. nov. = *Entoloma obrusseum* Horak, *Beih. Nova Hedwigia 65*: 110, 1980.

Entoloma fragile E. Horak, *Beih. Nova Hedwigia 43*: 56-7, 1973
on rotten debris (of 'tree fern') or wood (of *Dacrydium cupressinum*), Prov. Nelson, Pakawau Creek N of Collingwood, 7 May 1968, E. Horak (PDD 27041, isotype ZT 68/368).

Entoloma gelatinosum E. Horak, *Beih. Nova Hedwigia 43*: 40-1, 1973
on soil among litter in forests (under *Nothofagus* spp., *Dacrydium cupressinum, Quintinia, Coprosma,* etc.), Prov. Westcoast, Track from Taylorville to Mt Sewell, 1 Apr 1968, E. Horak (PDD 27028 [27029], isotype ZT 68/24 [68/243]).

Entoloma latericolor E. Horak, *Sydowia 28*: 194-6, 1975 (1976)
on rotten wood of *Agathis australis*, N of Auckland, Hobson Co., Waipoua Forest, 16 Apr 1972, J.M. Dingley (PDD 30274).

Entoloma m[a]cnabbianum E. Horak, *Beih. Nova Hedwigia 65*: 132, 1980
on soil in forest (*Agathis alba* [*australis*]), Auckland, Titirangi, Atkinson Park, 13 Mar 1967, R.F.R. McNabb (PDD 30272 [30271]). Named for R.F.R. McNabb, New Zealand mycologist.

Entoloma melleum E. Horak, *Beih. Nova Hedwigia 43*: 34-5, 1973
on rotten wood of *Dacrydium cupressinum*, Stewart I., X-mas [Christmas] Village, 13 Mar 1969, E. Horak (PDD 27025, isotype ZT 69/129).

Entoloma minutoalbum E. Horak, see *Entoloma sordidulum.*

Entoloma obrusseum E. Horak, see *Entoloma flavum.*

Entoloma peralbidum E. Horak, *Beih. Nova Hedwigia 43*: 58-60, 1973
on soil in forest or under shrubs, New Plymouth, Pukekura Park, 10 Jun 1968, E. Horak (PDD 27043, isotype ZT 68/521).

Entoloma perplexum E. Horak, *Beih. Nova Hedwigia 43*: 80-1, 1973
on soil in forests (under *Nothofagus* spp., *Dacrydium cupressinum*), Prov. Westcoast, N of Totara Flat, Ikamatua, 22 Mar 1968, E. Horak (PDD 27058, isotype ZT 68/213).

Entoloma perzonatum E. Horak, *Beih. Nova Hedwigia 43*: 48-9, 1973
between grasses in riverbeds, paddocks, etc., Prov. Southland, Te Anau, 3 Apr 1969, E. Horak (PDD 27035, isotype ZT 69/215).

Entoloma phaeomarginatum E. Horak, *Beih. Nova Hedwigia 43*: 70-2, 1973 on rotten trunk of *Dicksonia squarrosa*, Stewart I., Paterson Inlet, Ulva I.,, 23 Mar 1969, E. Horak (PDD 27052, isotype ZT 69/163).

Entoloma pluteimorphum E. Horak, see *Entoloma pluteoides*.

Entoloma pluteoides E. Horak (non *E. pluteoides* (Fr.) Karst., 1879), *Beih. Nova Hedwigia 43*: 33-4, 1973

on rotten wood of *Nothofagus fusca*, Prov. Nelson, Lewis Pass, Springs Junction, 5 Dec 1967, E. Horak (PDD 27024, isotype ZT 67/215). Nom. nov. = *Entoloma pluteimorphum* Horak, *Beih. Nova Hedwigia 65*: 181, 1980.

Entoloma porphyrescens E. Horak, *Beih. Nova Hedwigia 43*: 37-8, 1973

on soil among mosses and litter in forests (under *Nothofagus* spp., *Dacrydium cupressinum, Podocarpus* spp., *Metrosideros umbellata, Leptospermum* spp.), Fjordland [Fiordland] N. P., Lake Te Anau, Track to Mt Luxmore, 23 [26] Mar 1969, E. Horak (PDD 27027, isotype ZT 69/167).

Entoloma rancidulum E. Horak, *Beih. Nova Hedwigia 43*: 21-2, 1973

on soil among mosses and litter in and along the margin of forests (*Nothofagus* spp., *Leptospermum* spp., *Podocarpus ferrugineus, Weinmannia racemosa*), Prov. Southland, Te Anau Downs, Denton River, 1 Apr 1969, E. Horak (PDD 27017, isotype ZT 69/209).

Entoloma rubescentipes E. Horak, *Beih. Nova Hedwigia 43*: 54-6, 1973

on soil in forests (under *Leptospermum scoparium*), Stewart I., between X-mas [Christmas] Village and Mt Anglem, 14 Mar 1969, E. Horak (PDD 27040, isotype ZT 69/134).

Entoloma rubromarginatum E. Horak, *Beih. Nova Hedwigia 43*: 72, 1973

on or among litter of tree-fern (*Dicksonia* spp., *Cyathea* spp.), Coromandel Peninsula, Kauaeranga Valley, 5 Aug [Jul] 1968, E. Horak (PDD 27053, isotype ZT 68/637).

Entoloma sordidulum E. Horak (non *E. sordidulum* (Kühn. & Romagn.) Orton, 1960), *Beih. Nova Hedwigia 43*: 12-3, 1973

on rotten wood, Westland Prov., along the track between Taylorville and Mt Sewell, 31 Mar 1968, E. Horak (PDD 27012, isotype ZT 68/239). Nom. nov. = *Entoloma minutoalbum* Horak, *Sydowia 28*: 182, 1975 (1976).

Entoloma squamiferum E. Horak, *Beih. Nova Hedwigia 43*: 19-21, 1973

on soil among mosses and litter in forests (under *Beilschmi[e]dia, Weinmannia, Coprosma, Cyathea,* etc.) or on rotten wood (of *Nothofagus* spp.), Mt Egmont, Pouakai Range, Timaru Stream, 18 Jun 1968, E. Horak (PDD 27016, isotype ZT 68/565).

Entoloma sulphureum E. Horak, *Beih. Nova Hedwigia 43*: 60-1, 1973

on soil in forests (under *Leptospermum* spp., *Nothofagus* spp.), Prov. Nelson, N of Collingwood, Pakawau, 8 May 1968, E. Horak (PDD 27044, isotype ZT 68/392).

Entoloma translucidum E. Horak, *Beih. Nova Hedwigia 43*: 51-2, 1973

on soil in forests (under *Nothofagus* spp., *Leptospermum* spp., different Podocarpaceae), Prov. Westcoast, Lake Brunner, between Kumara and Mitchells, 2 Dec 1967 [9 Mar 1968], E. Horak (PDD 27037, isotype ZT 68/117).

Entoloma tristificum E. Horak, *Beih. Nova Hedwigia 43*: 57, 1973

on soil in forests (under *Nothofagus* spp.), Prov. Nelson, Lake Rotoiti, St. Arnaud Range, 5 May 1968, E. Horak (PDD 27042, isotype ZT 68/380).

Entoloma uligincola E. Horak, *Beih. Nova Hedwigia 65*: 247-8, 1980

among moss (*Sphagnum*) in swamps, Nelson, Tophouse Saddle, 4 Mar 1968, E. Horak (PDD 27146, isotype ZT 68/115).

Entoloma vulsum E. Horak, *Beih. Nova Hedwigia 43*: 43-5, 1973

on soil in forests (under *Nothofagus* spp., *Podocarpus* spp., *Dacrydium cupressinum, Quintinia* spp., etc.), Prov. Westcoast, Ngahere, S of Ahaura, 18 Mar 1968, E. Horak (PDD 27031, isotype ZT 68/186).

Epithele fulva G.H. Cunningham, *Trans. R. Soc. N.Z. 83*: 631-2, 1956

effused usually on decorticated rotting wood, rarely on bark of *Schefflera digitata*, Taranaki, Mt Egmont, Dawson Falls, 2300 ft, Jan 1953, J.M. Dingley (PDD 14245).

Epithele nikau G.H. Cunningham, *Trans. R. Soc. N.Z. 83*: 629-30, 1956
effused on dead pendent and fallen stipes of *Rhopalostylis sapida*, Auckland, Waitakeres, Cascades, 600 ft, [3] Apr 1954, S.D. Baker (PDD 14244). Maori name for host plant.

Eriopezia samuelsii R.P. Korf, *Mycotaxon 7*: 464-8, 1978
on dead leaves of *Gahnia* sp., Auckland Prov., Waitemata Co., Waitakere Ranges, off Mountain Rd.,Walker's Bush Track, 7 Aug 1974 [1973], G.J. Samuels ([PDD 31873], holotype CUP 57031). Named for G.J. Samuels, mycologist.

****Erysiphe carpophila*** H. Sydow, *Ann. Mycol. 22*: 294, 1924
in capsules of *Weinmannia sylvicola*, Auckland, 19 Jan 1923, A.G. Elliot (PDD 943).

****Erysiphe carpophila*** H. Sydow var. ***rubicola*** B.J. Murray, *Trans. Proc. N.Z. Inst. 57*: 218-20, 1927
on living leaves and twigs of *Rubus australis*, Nelson, West Coast Road, 15 Apr 1925, K.M. Curtis [PDD 43445].

Erysiphe densa M.J. Berkekey in J.D. Hooker, *Flora Novae-Zelandiae 2*: 208, 1855
on living leaves of *Aristotelia*, Wairarapa, W. Colenso [b598] [PDD 54541, holotype K].

Euantennaria caulicola S.J. Hughes, *N.Z. Jl Bot. 12*: 324-6, 1974
on living branches of *Coprosma* sp., Canterbury Province, Ashley Gorge, 14 May 1963, J.M. Dingley (PDD 25765, isotype DAOM 96664[b]).

Euantennaria novae-zelandiae S.J. Hughes, *N.Z. Jl Bot. 12*: 313-5, 1974
on living branches of *Coprosma* sp., Wellington Province, Tongariro National Park, Ohakune Mountain Road, c. 1000 m, 7 Mar 1963, S.J. Hughes (PDD 25763, isotype DAOM 93430d).

Euantennaria pacifica S.J. Hughes, *N.Z. Jl Bot. 12*: 318-20, 1974
on living branches of *Carpodetus serratus*, Canterbury Province, near Ashley Gorge, 14 May 1963, S.J. Hughes (PDD 25764, isotype DAOM 96455[a]).

Exobasidium dracophyllii R.F.R. McNabb, *Trans. R. Soc. N.Z. Bot. 1*: 263, 1962
Dracophyllum prostratum, Otago, Fiordland, Secretary I., [17] Feb 1960, R.F.R. McNabb (PDD 19664).

Exobasidium fraserii R.F.R. McNabb, *Trans. R. Soc. N.Z. Bot. 1*: 263, 1962
Cyathodes fraseri, Canterbury, Cass, May 1958, W.R. Philipson (PDD 19670).

Exobasidium novae-zealandiae R.F.R. McNabb, *Trans. R. Soc. N.Z. Bot. 1*: 264, 1962
Cyathodes fasciculata, Auckland, Piha, Nov 1959, J.M. Dingley (PDD 19659).

Exobasidium pentachondrae R.F.R. McNabb, *Trans. R. Soc. N.Z. Bot. 1*: 262-3, 1962
Pentachondra pumila, Otago, Fiordland, Secretary I., [17] Feb 1960, R.F.R. McNabb (PDD 19669).

Favolaschia calocera Heim var. ***claudopus*** R. Singer, *Beih. Nova Hedwigia 50*: 38-9, 1974
on branches of dicotyledonous trees, gregarious on *Elaeagnus pungens*, Waitemata County, Waitakere Ranges, Waiatarua, Jul 1973, R.E. Beaver [Beever] [PDD 31006].

Flammulaster foliicola E. Horak, *N.Z. Jl Bot. 18*: 181, 1980
on rotting leaves of *Cordyline indivisa*, Taranaki, Mt Egmont National Park, Stratford Mt Lodge, 12 Jun 1968, E. Horak (PDD 27159, isotype ZT 68/539).

Flammulaster pulveraceus E. Horak, *N.Z. Jl Bot. 18*: 180-1, 1980
on rotting leaves, stems, and wood of dicotyledonous plants and mosses, Taranaki, Mt Egmont National Park, Dawson Falls, 19 Jun 1968, E. Horak (PDD 27158, isotype ZT 68/573).

Fomes awhitu G.H. Cunningham, *Bull. Plant Dis. Div. N.Z. Dep. scient. ind. Res. 79*: 16, 1948
growing solitary or imbricate on bark or decorticated wood of fallen trunks of *Beilschmiedia tarairi*, Auckland, Awhitu Peninsula, 350 ft, Apr 1946, G.H. Cunningham [PDD 4496].

Fomes uncatus G.H. Cunningham, *Bull. Plant Dis. Div. N.Z. Dep. scient. ind. Res. 79*: 3, 1948
growing solitary upon bark of standing dead trees of *Dysoxylum spectabile*, Auckland, Riverhead, Jun [May] 1947, G.B. Rawlings [PDD 5776].

Fuscoporia kamahi G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 164*: 213-4 & 263, 1965
on dead bark of *Weinmannia racemosa*, Auckland, Mamaku Forest, 600 m, [9 Nov 1947, G.H. Cunningham] (PDD 5850). Maori name for host plant.

Fuscoporia nothofagi G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 164*: 214 & 263, 1965
on dead bark of *Nothofagus cliffortioides*, Wellington, Mt Ruapehu, Ohakune Track, 1000 m, [12 Dec 1947, G.B. Rawlings] (PDD 6613).

Fuscoporia tawhai G.H. Cunningham, *Bull. Plant Dis. Div. N.Z. Dep. scient. ind. Res. 73*: 8-9, 1948
on bark of fallen branches, dead branches attached to living trees, or upright dead saplings, of *Nothofagus cliffortioides*, Auckland, east slope of Mt Tongariro, Headwaters of Pangarara River, 4000 ft, Dec 1946, G.H. Cunningham [PDD 5509]. Maori name for *Nothofagus* spp.

Fusichalara dimorphospora S.J. Hughes & T.R. Nag Raj, *N.Z. Jl Bot. 11*: 663, 1973
on bark of dead *Weinmannia racemosa*, Westland, Lake Ianthe, Pukekura, 8 Apr 1963, S.J. Hughes (PDD 30402, isotype DAOM 96020i).

Fusichalara dingleyae S.J. Hughes & T.R. Nag Raj, *N.Z. Jl Bot. 11*: 665, 1973
on rotten wood, Auckland Province, Waitakere Range, Upper Piha Valley, [Home Track], 9 Oct 1963, S.J. Hughes (PDD 21599, isotype DAOM 93957a). Named for J.M. Dingley, New Zealand mycologist.

Fusichalara novae-zelandiae S.J. Hughes & T.R. Nag Raj, *N.Z. Jl Bot. 11*: 670-1, 1973
on rotten wood of *Leptospermum scoparium*, Auckland Province, Cornwallis, 3 Jan 1963, S.J. Hughes (PDD 30404, isotype DAOM 110040).

Fusicoccum luteum S.R. Pennycook & G.J. Samuels, *Mycotaxon 24*: 456-7, 1985
isolated from lesion on ripe fruit of *Actinidia deliciosa*, Bay of Plenty, Te Puke, No. 1 Road, DSIR Research Orchard, 6 Oct 1982, S.R. Pennycook (PDD 45400, cultotype ICMP 8004, ATCC 58193).

Fusicoccum parvum S.R. Pennycook & G.J. Samuels, *Mycotaxon 24*: 455-6, 1985
on small dead branches of *Populus nigra*, Bay of Plenty, Te Puke, No. 3 Road, Baldwin orchard, 17 Dec 1981, S.R. Pennycook (PDD 45438, cultotype ICMP 8003, ATCC 58191). Teleomorph = *Botryosphaeria parva* Pennycook & Samuels.

Galerina excentrica E. Horak, *Sydowia 40*: 69, 1987 (1988)
on rotten wood of broad-leaved tree (species unknown), Coromandel Peninsula, Kirikiri Valley, 10 Jul 1968, E. Horak (PDD 27221, isotype ZT 68/659).

Galerina nothofaginea E. Horak, *Sydowia 40*: 66-8, 1987 (1988)
on rotten wood (and bark) of *Nothofagus cliffortioides* and *N. fusca*, Nelson, Tophouse, 3 Mar 1968, E. Horak (PDD 27218, isotype ZT 68/107).

Gautieria novaezelandiae G.H. Cunningham, *Trans. Proc. R. Soc. N.Z. 67*: 410, 1938
on ground, Tongariro National Park, [Chateau, Apr 1931], J. Carter [PDD 8331].

Gigasperma cryptica E. Horak, *N.Z. Jl Bot. 9*: 491, 1971
in humus between roots of *Nothofagus fusca* and *N. menziesii*, Prov. Nelson, Lake Rotoiti, track to St. Arnaud Range, 23 May 1968, E. Horak (PDD 27002, isotype ZT [68/504]).

Gigaspora aurigloba I.R. Hall, *Trans. Br. mycol. Soc. 68*: 351, 1977
soil, Leith Saddle, [12 Jan 1976, I.R. Hall] [holotype PDD 34859]. Soil, Leith Saddle, [Oct 1972, I.R. Hall] [lectotype PDD 35157].

Gliocladium novaezelandiae K.A. Seifert, G.J. Samuels & W. Gams, *Stud. Mycol. 27*: 153-4, 1985
basidiomata of polypores, Buller district, near Lyell, 26 km S of Murchison, 16 Apr 1983, G.J. Samuels, [R.E. Beever, P.R. Johnston, R.H. Petersen] (PDD 44258, cultotype CBS 648.83). Teleomorph = *Sphaerostilbella novaezelandiae* Seifert, Samuels & Gams.

Gliomastix novae-zelandiae S.J. Hughes & C.H. Dickinson, *N.Z. Jl Bot. 6*: 108, 1968
on dead wood and bark of *Beilschmiedia tawa*, Auckland Prov., Mamaku State Forest, 22

Mar 1963, S.J. Hughes (PDD 25762, isotype DAOM 86181e [96181e]).

Gliophorus bichromus E. Horak, *Beih. Nova Hedwigia 43*: 170-1, 1973
in soil under *Nothofagus cliffortioides* (montane forest), Prov. Nelson, Lake Rotoiti, track to St. Arnaud Range, 5 May 1968, E. Horak (PDD 27093, isotype ZT 68/383).

Gliophorus fumosogriseus E. Horak, *N.Z. Jl Bot. 28*: 286, 1990
saprobic on soil among litter in mixed broadleaved-conifer forest (*Weinmannia, Metrosideros, Dacrydium, Dicksonia*), Westland, Copland River Valley, Karangarua, 7 Mar 1983, E. Horak (PDD 27229).

Gliophorus graminicolor E. Horak, *Beih. Nova Hedwigia 43*: 176-7, 1973
in soil amongst mosses under *Nothofagus, Dacrydium, Podocarpus, Metrosideros,* etc., Prov. Westcoast, Ngahere, Red Jack Valley, 21 Mar 1968, E. Horak (PDD 27096, isotype ZT 68/201).

Gliophorus lilacinoides E. Horak, *Beih. Nova Hedwigia 43*: 172, 1973
in soil amongst litter or on rotten wood in forests of *Nothofagus* spp. and *Podocarpus-Dacrydium* (associated with *Cyathea, Elaeocarpus, Knightia,* etc.), Coromandel Peninsula, Kauaeranga Valley, 5 Jul 1968, E. Horak (PDD 27094, isotype ZT 68/646).

Gliophorus lilacipes E. Horak, *Beih. Nova Hedwigia 43*: 178-9, 1973
on soil in *Nothofagus* forest with *Dycrydium* [*Dacrydium*], *Weinmannia,* etc., Fjordland [Fiordland], Lake Te Anau, track to Mt Luxmore, 9 Apr 1969, E. Horak (PDD 27097, isotype ZT 69/325).

Gliophorus luteoglutinosus E. Horak, *Beih. Nova Hedwigia 43*: 169, 1973
in soil under *Weinmannia, Metrosideros, Dacrydium,* etc., Coromandel Peninsula, Tapu, 11 Jul 1968, E. Horak (PDD 27092, isotype ZT 68/667).

Gliophorus ostrinus E. Horak, *N.Z. Jl Bot. 28*: 288, 1990
in moss forest, North Auckland, Little Barrier I., near summit of Mt Hauturu, 12 Jun 1981, E. Horak (PDD 27228).

Gliophorus pallidus E. Horak, *Beih. Nova Hedwigia 43*: 164-5, 1973
in soil under *Nothofagus* (*N. fusca, N. menziesii*), *Dacrydium cupressinum, Elaeocarpus,* etc., Urewera National Park, Ngamoko Track, 27 Jun 1968, E. Horak (PDD 27090, isotype ZT 68/613).

Gliophorus versicolor E. Horak, *Beih. Nova Hedwigia 43*: 175-6, 1973
amongst litter under *Nothofagus* (*N. fusca, N. cliffortioides*), *Podocarpus, Dacrydium, Quintinia,* etc., Prov. Westcoast, Totara Flat, S of Ahaura, 21 Mar 1968, E. Horak (PDD 27095, isotype ZT 68/202).

Gliophorus viscaurantius E. Horak, *Beih. Nova Hedwigia 43*: 165, 1973
amongst mosses or on rotten wood under *Nothofagus, Dacrydium, Weinmannia,* etc., Prov. Westcoast, S of Lake Hochstetter, 12 [21] Mar 1968, E. Horak (PDD 27091, isotype ZT 68/146).

Gloeosporidium coprosmae H. Sydow, *Ann. Mycol. 22*: 314-5, 1924
in leaves of *Coprosma serrulata*, Westland, Arthurs Pass, 11 Jan 1920, E.H. Atkinson (PDD 1008).

Glomus infrequens I.R. Hall, *Trans. Br. mycol. Soc. 68*: 345-7, 1977
soil, [Otago], Leith Saddle, [7 Jan 1976], I.R. Hall [PDD 34858].

Glomus invermaius I.R. Hall, *Trans. Br. mycol. Soc. 68*: 345, 1977
soil, [Otago], Invermay, [7 Jan 1976], I.R. Hall [PDD 34857].

Glomus magnicaulis I.R. Hall, *Trans. Br. mycol. Soc. 68*: 345, 1977
soil, [Otago], Leith Saddle, [12 Jan 1976], I.R. Hall [PDD 34855].

Glomus pallidus I.R. Hall, *Trans. Br. mycol. Soc. 68*: 343, 1977
soil, Tautuku Beach, [Nov 1972], I.R. Hall [PDD 34854].

Gnomonia bullata B.J. Murray, *Trans. Proc. N.Z. Inst. 56*: 65-6, 1926
on dead twigs and branches, still attached, of *Salix babylonica* and *Salix fragilis*, Nelson, [old cemetery], 15 Sep 1923 [9 Aug 1923, B.J. Murray] [lectotype PDD 43465].

Gomphus dingleyi [dingleyae] B.P. Segedin, *N.Z. Jl Bot. 22*: 536, 1984
in litter in mixed podocarp-broadleaf forest, Auckland, Waitakere Road, Waiatarua, 26 Jul 1972, J.M. Dingley (PDD 30179). Named for J.M. Dingley, New Zealand mycologist.

Gomphus novae-zelandiae B.P. Segedin, *N.Z. Jl Bot. 22*: 533-6, 1984
gregarious in mixed podocarp-broadleaf forest, Auckland, Titirangi, Atkinson's Park, 19 Jun 1980, B.P. Segedin (PDD 44960).

Guedea novae-zelandiae S.J. Hughes, *N.Z. Jl Bot. 18*: 65, 1980
on dead wood of *Freycinetia banksii*, Auckland Province, Cornwallis, 31 Dec 1962, J.M. Dingley (PDD 36099, isotype DAOM 93822).

Guignardia fulvida F.R. Sanderson, *N.Z. Jl agric. Res. 8*: 139, 1965
Linum marginale, Canterbury, Burnham, [26] Sep 1963, F.R. Sanderson (PDD 23784, isotype PDD 23785. Anamorph = *Aureobasidium pullans* (de Bary) Arnaud var. *lini* (Lafferty) Cooke.

Gymnopilus mesosporus E. Horak, *Opera Bot. 100*: 124, 1989
on rotten trunk of ? *Podocarpus* sp., North Auckland, Omahuta, 11 May 1981, E. Horak (PDD 27263, isotype ZT 552).

Hadrosporium dingleyae S.J. Hughes, *N.Z. Jl Bot. 18*: 67, 1980
on rotten wood, Waitakere Range, Upper Piha Valley, Centennial Track, 2 May 1963, S.J. Hughes (PDD 20961, isotype DAOM 93817). Named for J.M. Dingley, New Zealand mycologist.

Hamaspora australis G.H. Cunningham, *Trans. Proc. N.Z. Inst. 61*: 402, 1930
Rubus australis, Canterbury, Otira Gorge, 500 m, [30 Jan 1920], E.H. Atkinson [PDD 1489].

Harknessia globosa B.C. Sutton, *Mycol. Pap. 123*: 15, 1971
on dead leaves of *Eucalyptus globulus*, Taranaki, [New Plymouth, 2] Oct 1922, W. Smith ([PDD 10402], holotype IMI 21815).

Helminthosporium dictyoseptatum S.J. Hughes, *N.Z. Jl Bot. 18*: 69-70, 1980
on dead twigs [of *Pseudopanax crassifolium*], Auckland Province, Waitakere Range, Henderson Valley, Walker's Bush, 30 Jan 1963, F.J. Morton (PDD 20506, isotype DAOM 109608).

Helminthosporium novae-zelandiae S.J. Hughes, *N.Z. Jl Bot. 18*: 72, 1980
on dead wood and bark of *Vitex lucens*, Auckland Province, Waitakere Range, Piha, 31 Jul 1963, J.M. Dingley (PDD 36098, isotype DAOM 109629).

Helotium allantosporum R.W.G. Dennis, *Kew Bull. 15*: 303-4, 1962
on bark [of *Agathis australis*], Auckland, Huia, 4 May 1957, J.D. Atkinson (PDD 19034).

Helotium elaeocarpi R.W.G. Dennis, *Kew Bull. 15*: 304, 1962
on leaves of *Elaeocarpus dentatus*, Auckland, Waitakere Ra., Oratia, [Rangemore Track], 7 Jul 1957, J.M. Dingley (PDD 19047).

Helotium griseliniae R.W.G. Dennis, *Kew Bull. 15*: 304-5, 1962
on fallen leaves of *Griselinia littoralis*, Auckland, Ruapehu, [Whakapapa], 900 m, 20 Oct 1949, J.M. Dingley (PDD 19046).

Helotium metrosideri R.W.G. Dennis, *Kew Bull. 15*: 306-7, 1962
on leaves of *Metrosideros*, Auckland, Waitakere Ra., Waiatarua, 29 May 1958, J.M. Dingley [S.M. McBeth] (PDD 19040).

Helotium novae-zelandiae R.W.G. Dennis, *Kew Bull. 15*: 307, 1962
on decorticated wood, Otago, Tapanui, Black Gully, 19 Apr 1957, S.D. Brook, P.J. Brook (PDD 19039).

Helotium quintiniae R.W.G. Dennis, *Kew Bull. 15*: 309, 1962
on bark of *Quintinia serrata*, Westland, Okarito, The Forks, 21 Apr [May] 1955, J.M. Dingley (PDD 19041).

Helotium sordidum W. Phillips in M.C. Cooke, *Grevillea 15*: 17, 1886
under rotten wood, W. Colenso b313 [PDD 40403, holotype K].

Helotium subcinnabarinum R.W.G. Dennis, *Kew Bull. 15*: 310, 1962
on leaves of *Elaeocarpus dentatus*, Westland, Harihari, 8 Nov 1954, J.M. Dingley (PDD

19052).

Heterobasidion araucariae P.K. Buchanan, *Mycotaxon 32*: 325-6, 1988
on fallen branch of *Agathis australis*, Northland, Waipoua Forest Sanctuary, Yakas Kauri Track, 25 Sep 1985, P.K. Buchanan (PDD 48002). Named for host plant family.

Heteropatella eriophila H. Sydow, *Ann. Mycol. 22*: 313, 1924
on leaves of *Celmisia coriacea*, Westland, Arthur's Pass, 15 Dec 1920, E.D. [E.H.] Atkinson (PDD 1031).

Hydnum tabacinum M.C. Cooke, *Grevillea 14*: 129, 1886
W. Colenso b150 [PDD 35817, holotype K].

Hydnum carbonarium G.H. Cunningham, *Trans. R. Soc. N.Z. 85*: 591-2, 1958
solitary in humus under *Dacrydium cupressinum*, Otago, Stewart I., Half Moon Bay, [20] Feb 1954, J.M. Dingley (PDD 17707).

Hydnum crocidens Cooke var. **badius** R.F.R. McNabb, *N.Z. Jl Bot. 9*: 369, 1971
gregarious or occasionally caespitose under *Leptospermum ericoides*, Auckland, Titirangi, Atkinson Park, 10 Sep 1965, R.F.R. McNabb (PDD 24713).

Hydnum scopinellum M.J. Berkeley in J.D. Hooker, *Flora Novae-Zelandiae 2*: 181, 1855
on dead wood, W. Colenso [PDD 35822, holotype K].

Hydnum wellingtonii C.G. Lloyd, *Mycol. Notes 69*: 1200-1, 1923
on ground in beech forest, [Wellington, York Bay, Aug 1922, E.H. Atkinson] [PDD 628].

Hygrocybe apricosa E. Horak, *Beih. Nova Hedwigia 43*: 146-7, 1973
on soil amongst mosses and litter of *Weinmannia, Metrosideros, Senecio, Olearia,* etc., Stewart I., X-mas [Christmas] Village, Track to Mt Anglem, 15 Mar 1969, E. Horak (PDD 27084, isotype ZT 69/138).

Hygrocybe blanda E. Horak, *N.Z. Jl Bot. 28*: 261, 1990
on soil among moss and litter in mixed moss forest, North Auckland, Little Barrier I., near summit of Mt Hauturu, 12 Jun 1981, E. Horak (PDD 27185).

Hygrocybe cavipes E. Horak, *Beih. Nova Hedwigia 43*: 139-40, 1973
in soil under *Leptospermum scoparium* and *L. ericoides*, Prov. Nelson, Puponga, 17 May 1968, E. Horak (PDD 27082, isotype ZT 68/472).

Hygrocybe cerinolutea E. Horak, *Beih. Nova Hedwigia 43*: 145-6, 1973
in soil under *Metrosideros umbellata, Weinmannia, Quintinia,* etc., Prov. Westcoast, Totara Flat, Granville Forest, Track to Elliott Range, 4 Apr 1968, E. Horak (PDD 27083, isotype ZT 68/262).

Hygrocybe conspicua E. Horak, *Beih. Nova Hedwigia 43*: 133-4, 1973
in soil amongst litter of *Nothofagus* (*N. menziesii, N. fusca*) and *Dacrydium cupressinum*, Prov. Westcoast, S of Lake Hochstetter, 12 Mar 1968, E. Horak (PDD 27079, isotype ZT 68/141).

Hygrocybe elegans E. Horak, *Beih. Nova Hedwigia 43*: 153-5, 1973
amongst litter on soil under *Weinmannia racemosa, Dacrydium cupressinum,* etc., Prov. Westland, Okarito Trig, in coastal forest, 19 Feb 1969, E. Horak (PDD 27086, isotype ZT 69/96).

Hygrocybe fuliginata E. Horak, *Beih. Nova Hedwigia 43*: 136-7, 1973
amongst mosses under *Leptospermum scoparium* (and *Nothofagus cliffortioides*), Prov. Southland, NE of Lake Te Anau, Track to Denton Range, 30 Mar 1969, E. Horak (PDD 27080, isotype ZT 69/198).

Hygrocybe luteovirens E. Horak, *Beih. Nova Hedwigia 43*: 148-9, 1973
in soil under *Weinmannia, Schefflera, Aristotelia, Fuchsia,* etc., Prov. Westland, SE of Hari Hari, Track to Wilberg, 15 Feb 1969, E. Horak (PDD 27085, isotype ZT 69/78).

Hygrocybe rosella E. Horak, *Beih. Nova Hedwigia 43*: 133, 1973
in soil under *Podocarpus, Dacrydium, Weinmannia,* etc., Prov. Westcoast, Ngahere, Red Jack Valley, 21 Mar 1968, E. Horak (PDD 27078, isotype ZT 68/200).

Hygrocybe striatolutea E. Horak, *Beih. Nova Hedwigia 43*: 137-9, 1973 in soil under broadleaf trees (*Metrosideros, Elaeocarpus, Dodonaea, Rhopalostylis*, etc.), Prov. Nelson, Kaihoka Reserve, 10 May 1968, E. Horak (PDD 27081, isotype ZT 68/417).

Hygrophoropsis coacta R.F.R. McNabb, *N.Z. Jl Bot. 7*: 359, 1969
gregarious under *Leptospermum scoparium*, Wellington Province, Lake Rotoaira, 3 May 1967, R.F.R. McNabb (PDD 25907).

Hygrophorus carcharias E. Horak, *Beih. Nova Hedwigia 43*: 160-1, 1973
in soil under *Podocarpus, Dacrydium, Beilschmiedia* and different tree-ferns, Mt Egmont, Pouakai Range, Timaru Stream, 16 Jun 1968, E. Horak (PDD 27089, isotype ZT 68/555).

Hygrophorus segregatus E. Horak, *N.Z. Jl Bot. 28*: 292-4, 1990
in broadleaved-conifer forest, North Auckland, Waipoua, 22 Jun 1981, E. Horak (PDD 27225).

Hymenochaete bispora G.H. Cunningham, *Trans. R. Soc. N.Z. 85*: 8-10, 1957
on bark of dead fallen branches of *Nothofagus fusca*, Nelson, Lake Rotoiti, 2000 ft, [26] Apr 1956, S.D. Brook, [P.J. Brook] (PDD 16548).

Hymenochaete contiformis G.H. Cunningham, *Trans. R. Soc. N.Z. 85*: 41-3, 1957
effused on bark of dead branches of *Leptospermum scoparium*, Auckland, Katikati, Rereatukahia Reserve, 300 ft, [9] Sep 1954, G.H. Cunningham (PDD 16604).

Hymenochaete dictator G.H. Cunningham, *Trans. R. Soc. N.Z. 85*: 32-3, 1957
effused on bark of dead branches of *Beilschmiedia tawa*, Wellington, Carterton, Carter's Bush, 150 ft, [18] Dec 1952, G.H. Cunningham (PDD 12466).

Hymenochaete dissimilis G.H. Cunningham, *Trans. R. Soc. N.Z. 85*: 44-5, 1957
effused on bark or decorticated wood of branches and trunks of *Nothofagus truncata*, Auckland, Lake Waikaraeiti track, 2800 ft, [24] Sep 1950, G.H. Cunningham (PDD 7644).

Hymenochaete gladiola G.H. Cunningham, *Trans. R. Soc. N.Z. 85*: 10-2, 1957
effused on bark of dead branches of *Weinmannia racemosa*, Taranaki, Mt Egmont, [Dawson Falls], 3500 ft [2500 ft, 30] Jan 1953, J.M. Dingley (PDD 12461).

Hymenochaete innexa G.H. Cunningham, *Trans. R. Soc. N.Z. 85*: 47-8, 1957
effused on bark of dead branches of *Griselinia lucida*, Wellington, Mt Hauhangatahi, 3000 ft, Feb 1952, G.H. Cunningham (PDD 16627).

Hymenochaete lignosa G.H. Cunningham, *Trans. R. Soc. N.Z. 85*: 38, 1957
adnate on decorticated decaying trunks of *Nothofagus fusca*, Nelson, Reefton, Staircase Creek, 2000 ft, [2] Dec 1952, S.D. Baker (PDD 16637).

Hymenochaete magnahypha G.H. Cunningham, *Trans. R. Soc. N.Z. 85*: 45, 1957
effused on bark of dead branches of *Coprosma australis*, Auckland, Little Barrier I., House Creek, [24] Nov 1947, J.M. Dingley (PDD 5916).

Hymenochaete minuscula G.H. Cunningham, *Trans. R. Soc. N.Z. 85*: 48-9, 1957
effused on bark of dead branches of *Metrosideros excelsa*, Auckland, Piha, White's Stream, Jan 1951, J.M. Dingley (PDD 11242).

Hymenochaete obesa G.H. Cunningham, *Trans. R. Soc. N.Z. 85*: 15, 1957
on bark of dead stems and twigs of *Dracophyllum subulatum*, Wellington, Mt Tongariro, Pangarara River, 3500 ft, Dec 1946, E.M. Smith (PDD 7447).

Hymenochaete patelliformis G.H. Cunningham, *Trans. R. Soc. N.Z. 85*: 18-9, 1957
on bark of dead branches of *Leptospermum ericoides*, Wellington, Lake Papaetonga [Papaitonga], 50 ft, [30] Aug 1956, G.H. Cunningham (PDD 16535).

Hymenochaete plurimaesetae G.H. Cunningham, *Trans. R. Soc. N.Z. 85*: 27-8, 1957
scattered or crowded on bark and decorticated wood of branches and stems of *Coprosma cuneata*, Wellington, Kaimanawas, Tongariro River, 2800 ft, [19] Dec 1955, G.H. Cunningham (PDD 16540).

Hymenochaete separata G.H. Cunningham, *Trans. R. Soc. N.Z. 85*: 50, 1957
effused on bark of dead stems of *Geniostoma ligustrifolium*, Auckland, Te Araroa, 600 ft, [22] May 1952, G.H. Cunningham (PDD 11499).

Hymenochaete stratura G.H. Cunningham, *Trans. R. Soc. N.Z. 85*: 37-8, 1957
effused on bark of dead branches of *Podocarpus hallii*, Taranaki, Mt Egmont, Dawson Falls,

3500 ft, Nov 1953, J.M. Dingley (PDD 12463).

Hymenochaete vaginata G.H. Cunningham, *Trans. R. Soc. N.Z. 85*: 30-1, 1957
loosely attached to bark of dead branches and trunks of *Phyllocladus alpinus*, Wellington, Mt Ruapehu, Whakapapa, 3000 ft, [20] Oct 1949, J.M. Dingley (PDD 7437).

Hymenochaete vallata G.H. Cunningham, *Trans. R. Soc. N.Z. 85*: 46-7, 1957
effused on bark and decorticated dead branches of *Coprosma arborea*, Auckland, Coromandel Peninsula, Wilson's Point, [30] Aug 1954, J.M. Dingley (PDD 16529).

Hyphosoma hypoxyloides H. Sydow, *Ann. Mycol. 22*: 315, 1924
on living trunk of *Nothofagus fusca*, Otago, Conway River, 12 Jan 1920, E.H. Atkinson (PDD 1050).

Hypocrea atro-gelatinosa J.M. Dingley, *Trans. R. Soc. N.Z. 83*: 645-6, 1956
[on *Fuscoporia* sp.], Auckland, Hunua Ra., Otau, [25] Apr 1950, J.M. Dingley (PDD 10471).

Hypocrea coprosma J.M. Dingley, *Trans. Proc. R. Soc. N.Z. 79*: 328, 1952
on rotten wood of *Coprosma robusta*, Auckland, Waitakere Range, Waiatarua, Nov 1948, J.M. Dingley [PDD 10453].

Hypocrea egmontensis J.M. Dingley, *Trans. R. Soc. N.Z. 83*: 647, 1956
[on rotten wood], Taranaki, Mt Egmont, [below hostel, 3000 ft, 2] Apr 1946, J.M. Dingley (PDD 6272).

Hypocrea hunua J.M. Dingley, *Trans. Proc. R. Soc. N.Z. 79*: 327, 1952
on rotten wood, Auckland, Hunua Ra., Mangatawhiri Stream, Aug [14 Jul] 1946, J.M. Dingley [PDD 10455].

Hypocrea macrospora J.M. Dingley, *Trans. Proc. R. Soc. N.Z. 79*: 330-1, 1952
on bark of living *Leptospermum scoparium*, Auckland, Waitakere Ra., off Anawhata Road, [5] Oct 1946, J.M. Dingley [PDD 10472].

Hypocrea manuka J.M. Dingley, *Trans. Proc. R. Soc. N.Z. 79*: 327-8, 1952
on rotten wood of *Leptospermum scoparium*, Auckland, Bay of Islands, Ngaitonga Ra., Jun 1948, J.M. Dingley [PDD 10450]. Maori name for host plant.

Hypocrea novae-zealandica J.M. Dingley, *Trans. Proc. R. Soc. N.Z. 79*: 336, 1952
on dead branches of *Melicytus ramiflorus*, Auckland, Waitakere Ra., Cutty Grass Road, Aug 1948, J.M. Dingley [PDD 6262].

Hypocrea tawa J.M. Dingley, *Trans. Proc. R. Soc. N.Z. 79*: 335, 1952
on rotten wood of *Beilschmiedia tawa*, Auckland, near Alfriston, [10] Aug 1948 [1946], J.M. Dingley [PDD 4628].

Hypocrea toro J.M. Dingley, *Trans. Proc. R. Soc. N.Z. 79*: 329, 1952
on bark of dead branches of *Suttonia salicina*, Auckland, Coromandel Peninsula, Colville, [Western slopes of Te Moehau], Jan 1947 [1946], J.M. Dingley [PDD 10454].

Hypoderma alborubrum P.R. Johnston, *N.Z. Jl Bot. 28*: 164, 1990
on dead leaves of *Dracophyllum traversii*, Gisborne, Urewera Nat. Park, L. Waikaremoana, Puniho Tr., 29 May 1983, P.R. Johnston (PDD 53984).

Hypoderma bidwillii P.R. Johnston, *N.Z. Jl Bot. 28*: 165, 1990
on fallen leaves of *Brachglottis bidwillii*, Taupo, Tongariro National Park, Track from Turoa to Mangaturuturu hut, 20 Nov 1984, P.R. Johnston (PDD 53902).

Hypoderma bihospitum P.R. Johnston, *N.Z. Jl Bot. 28*: 167, 1990
on dead leaves and inflorescence stems of *Uncinia uncinata*, Northland, Puketi State Forest, Waiohanga Tr., 23 Oct 1987, P.R. Johnston (PDD 53886).

Hypoderma campanulatum P.R. Johnston, *N.Z. Jl Bot. 28*: 169, 1990
on dead leaves of *Dracophyllum latifolium*, Northland, Russell State Forest, Ngaiotonga Saddle, 11 Aug 1988, P.R. Johnston (PDD 45116 [54116]).

Hypoderma carinatum P.R. Johnston, *N.Z. Jl Bot. 28*: 169, 1990
on dead leaves of *Dracophyllum traversii*, Coromandel, Moehau, Te Hope Stream Tr., 800 m, 28 Aug 1984, P.R. Johnston (PDD 46709).

Hypoderma cookianum P.R. Johnston, *N.Z. Jl Bot. 28*: 171, 1990 on dead leaves of *Phormium cookianum*, Coromandel, Little Barrier I., Summit Ridge, 13 Jun 1984, P.R. Johnston (PDD 54866).

Hypoderma cordylines P.R. Johnston, *N.Z. Jl Bot. 28*: 172, 1990

on dead leaves of *Cordyline australis*, Auckland, Waitakere Ra., Rangemore Tr., 4 Oct 1983, P.R. Johnston, S.L. Parkes (PDD 45034).

Hypoderma dundasicum P.R. Johnston, *N.Z. Jl Bot. 28*: 173, 1990

on fallen leaves of *Gaultheria subcorymbosa*, Wellington, Tararua Ra., vic. Dundas Hut, 11 Feb 1985, P.R. Johnston (PDD 46768, isotype IMI 336654).

Hypoderma obtectum P.R. Johnston, *N.Z. Jl Bot. 28*: 174, 1990

on fallen leaves of *Nothofagus truncata*, Coromandel, Little Barrier I., Awaroa Stream, 12 Jun 1984, P.R. Johnston (PDD 49256).

Hypoderma sigmoideum P.R. Johnston, *N.Z. Jl Bot. 28*: 178-9, 1990

on dead leaves of *Nothofagus solandri* var. *cliffortioides*, Fiordland, Fiordland Nat. Park, L. Hauroko, 8 May 1984, P.R. Johnston, [J.S. Dugdale, H. Donner] (PDD 46212).

Hypoderma sticheri P.R. Johnston, *N.Z. Jl Bot. 28*: 179, 1990

on midribs of dead fronds of *Sticherus cunninghamii*, Westland, Fox Glacier, Gillespies Beach Rd., 7 Apr 1983, P.R. Johnston, G.J. Samuels, R.E. Beever, R.H. Petersen (PDD 43974).

Hypohelion parvum P.R. Johnston, *Mycotaxon 39*: 224-5, 1990

on dead leaves of *Carex* sp., Westland, Fox Glacier, Lake Gault, 10 Apr 1983, P.R. Johnston (PDD 48879).

Hypomyces badius C.T. Rogerson & G.J. Samuels, *Mycologia 81*: 419-20, 1989

on members of the *Boletaceae*, Auckland, Waitemata City, Waitakere Ranges, Huia Rd., Mill Bay, 30 May 1983, G.J. Samuels, R.H. Petersen, T. Matsushima (PDD 44196, isotype NY). Anamorph = *Sepedonium* sp.

Hypomyces dactylarioides G.R.W. Arnold, *Z. Pilzk. 37*: 188, 1971 (1972)

on fruitbody of *Stereum* sp., Prov. Auckland, Orere Point, 22 Jun 1958, S.D. Brook (PDD 18393).

Hypomyces novae-zealandiae J.M. Dingley, *Trans. Proc. R. Soc. N.Z. 79*: 59-60, 1951

on pileus of *Polyporus* sp., Auckland, Waitakere Ra., off Anawhata Rd., [16] Aug 1947, J.M. Dingley [PDD 6282].

Hypomyces papulasporae var. **papulasporae** C.T. Rogerson & G.J. Samuels, *Mycologia 77*: 766, 1985

on ascomata of *Trichoglossum hirsutum*, Northland, Hokianga County, S of Kaitaia, vic. Mangamuka Bridge, Omahuta S.F., vic. forest headquarters, 10 May 1981, G.J. Samuels, E. Horak (PDD 42199, isotype NY). Synanamorphs = *Sibirina*-like, *Papulaspora* sp.

Hypomyces petchii G.R.W. Arnold, *Z. Pilzk. 37*: 187, 1971 (1972)

on fruitbody of *Russula* sp., Prov. Auckland, near Henderson, Sharps Bush, 20 Feb 1966, R.F.R. McNabb (PDD 25041). Named for P.T. Petch, mycologist.

Hysterangium hautu G.H. Cunningham, *Trans. Proc. R. Soc. N.Z. 67*: 409, 1938

on ground, Auckland, Waimarino, [Feb 1930], J.C. Neill [PDD 8311]. Refers to a locality, Hautu Pa, near where the type specimen was found.

Hysterangium lobatum G.H. Cunningham, see *Phallobata alba.*

Hysterangium tunicatum G.H. Cunningham, *Trans. Proc. R. Soc. N.Z. 67*: 409, 1938

on ground, Nelson, Fringe Hill, [Nov 1923], G.H. Cunningham [PDD 8321].

***Induratia apiospora** G.J. Samuels, E. Müller & O. Petrini, *Mycotaxon 28*: 484-5, 1987

on decorticated wood, Northland, Hokianga County, Waipoua State Forest, along Yakas Track, 30 May 1982, G.J. Samuels, P.R. Johnston (PDD 44399). Anamorph = *Nodulisporium* sp.

Inocybe albovestita E. Horak, *N.Z. Jl Bot. 15*: 725, 1977

on soil among litter and moss under *Nothofagus* (*N. fusca, N. menziesii, N. cliffortioides*), Westcoast, Kopara, 13 Dec 1967, E. Horak (PDD 27128, isotype ZT 67/248).

Inocybe calamistratoides E. Horak, *N.Z. Jl Bot. 15*: 716, 1977 on soil under *Nothofagus* (*N. fusca, N. cliffortioides*), Westcoast, Araua, Granite Creek, 17 Dec 1967, E. Horak (PDD 27121, isotype ZT 67/262).

Inocybe cerea E. Horak, *N.Z. Jl Bot. 15*: 718, 1977

on soil under *Nothofagus* (*N. cliffortioides, N. menziesii*), *Dacrydium*, and *Podocarpus*, Fjordland [Fiordland], East slopes of Mt Luxmore, Lake Te Anau, 26 Mar 1969, E. Horak (PDD 27122, isotype ZT 69/172).

Inocybe destruens E. Horak, *N.Z. Jl Bot. 15*: 721, 1977

on rotten wood and bark of *Dacrydium cupressinum* in *Nothofagus* forest, Westcoast, Lake Hochstetter, 12 Mar 1968, E. Horak (PDD 27124, isotype ZT 68/148).

Inocybe latericia E. Horak, *N.Z. Jl Bot. 15*: 716, 1977

on soil among moss and litter of *Nothofagus* (*N. fusca, N. menziesii*), Nelson, Murchison, Matakitaki, 28 Jan 1969, E. Horak (PDD 27120, isotype ZT 69/35).

Inocybe luteobulbosa E. Horak, *N.Z. Jl Bot. 15*: 725, 1977

on soil, among *Sphagnum*, or on rotten wood in *Nothofagus* forests (*N. fusca, N. cliffortioides*), Urewera National Park, Tawa Track, 24 Jun 1968, E. Horak (PDD 27129, isotype ZT 68/584).

Inocybe luteobulbosa E. Horak var. ***volvata*** E. Horak, *N.Z. Jl Bot. 15*: 727, 1977

between *Sphagnum* (in 'pakihi'-associations) under *Nothofagus cliffortioides* or on rotten wood in beech forests, Nelson, Tophouse Saddle, 1 May 1968, E. Horak (PDD 27130, isotype ZT 68/333).

Inocybe mendica E. Horak, *N.Z. Jl Bot. 15*: 721, 1977

on soil under *Nothofagus* (*N. fusca*), *Leptospermum*, and *Elaeocarpus*, Urewera National Park, Tawa Track, 24 Jun 1968, E. Horak (PDD 27125, isotype ZT 68/580).

Inocybe phaeosquarrosa E. Horak, *N.Z. Jl Bot. 15*: 723, 1977

on rotten wood and bark of *Nothofagus cliffortioides*, Southland, Te Anau, Te Anau Bush, 8 Apr 1969, E. Horak (PDD 27126, isotype ZT 69/244).

Inocybe renispora E. Horak, *N.Z. Jl Bot. 15*: 715, 1977

on soil under *Leptospermum* (*L. ericioides*) and/or *Nothofagus* (*N. cliffortioides, N. menziesii*), Nelson, Richmond Range, Pine Valley, 5 Jan 1968, E. Horak (PDD 27119, isotype ZT 68/5).

Inocybe scabriuscula E. Horak, *N.Z. Jl Bot. 15*: 729, 1977

on soil among litter and moss (also *Sphagnum*) under *Nothofagus* (*N. fusca, N. cliffortioides*), Nelson, Tophouse Saddle, 22 Jan 1969, E. Horak (PDD 27127, isotype ZT 69/4).

Inocybe strobilomyces E. Horak, *N.Z. Jl Bot. 15*: 720-1, 1977

on rotten wood in *Nothofagus* forests (*N. fusca*), Westcoast, between Blackwater and Waiuta, 2 Apr 1968, E. Horak (PDD 27123, isotype ZT 68/249).

Inocybe umbrosa E. Horak, *N.Z. Jl Bot. 15*: 729, 1977

on soil among moss and litter under *Nothofagus* (*N. cliffortioides, N. menziesii*) and *Leptospermum* (*L. scoparium, L. ericoides*), rarely also on rotten wood of *Nothofagus*, Westcoast, S of Lake Hochstetter, 17 Mar 1968, E. Horak (PDD 27131, isotype ZT 68/175).

Inonotus nothofagi G.H. Cunningham, *Bull. N.Z. Dep. sci. indust. Res. 78*: 1-2, 1948

imbricate on bark or decorticated wood of standing trees of *Nothofagus solandri*, Wellington, Day's Bay, 650 ft, Aug [May] 1947, G.B. Rawlings [PDD 5795].

Iodosphaeria ripogoni G.J. Samuels, E. Müller & O. Petrini, *Mycotaxon 28*: 490-2, 1987

on stems of *Rhipogonum scandens*, Chatham Islands, Taiko Camp, 8 Mar 1983, E.H.C. McKenzie (PDD 47872). Synanamorphs = *Selenosporella* sp., *Ceratosporium* sp.

Irpex spiculifer G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 164*: 74 & 261, 1965

on dead bark and decorticated wood of *Nothofagus fusca*, Nelson, Staircase Creek, Reefton, 700 m, [29 Nov 1952, S.D. Baker] (PDD 19144).

Labyrinthomyces phymatodeus B.-C. Zhang & D.W. Minter, *Systema Ascomycetum 7*: 48, 1988

[in soil] under *Leptospermum* sp., Taranaki [Taupo, Kaimanawa Range], 1979, H. Lintott [B. Thompson, R. Dean] (PDD 56788, holotype K).

Laccaria fibrillosa R.F.R. McNabb, *N.Z. Jl Bot. 10*: 468, 1972
gregarious to caespitose under *Nothofagus fusca*, Nelson, Lake Daniels Track, 15 May 1969, R.F.R. McNabb (PDD 29639).

Laccaria glabripes R.F.R. McNabb, *N.Z. Jl Bot. 10*: 477, 1972
gregarious to caespitose under *Nothofagus menziesii*, Nelson, Lake Daniels Track, 25 Apr 1969, R.F.R. McNabb (PDD 29640).

Laccaria masonii G. Stevenson var. ***brevispinosa*** R.F.R. McNabb, *N.Z. Jl Bot. 10*: 466, 1972
densley gregarious to caespitose under *Nothofagus menziesii*, Nelson, Lake Daniels Track, 16 May 1969, R.F.R. McNabb (PDD 29641 [29701]).

Laccaria ohiensis (Mont.) Singer var. ***paraphysata*** R.F.R. McNabb, *N.Z. Jl Bot. 10*: 474, 1972
gregarious under *Leptospermum ericoides*, Auckland, Titirangi, Atkinson Park, 12 Jul 1967, R.F.R. McNabb (PDD 25973).

Lachnella aotearoa G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 145*: 311 & 331, 1963
on bark of dead branches of *Rubus australis*, Auckland, Henderson Valley, Walkers Bush, 120 m, [23 Jul 1958, J.M. Dingley] (PDD 18614). Maori name for New Zealand.

Lachnella coprosmae G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 145*: 316 & 331, 1963
on bark of dead twigs of *Coprosma foetidissima*, Westland, Pukekura, 30 m, [11 Nov 1954, J.M. Dingley] (PDD 18633).

Lachnella nikau G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 145*: 312-3 & 331, 1963
on bark of dead stipes of *Rhopalostylis sapida*, Auckland, Piha, Centennial Track, [1 Apr 1956, S.D. Brook] (PDD 18615). Maori name for host plant.

Lactarius clarkei J.B. Cleland var. ***aurantiorubra*** R.F.R. McNabb, *N.Z. Jl Bot. 9*: 60-1, 1971
gregarious under *Nothofagus fusca* and *N. menziesii* [*N. solandri*], Nelson, Springs Junction [National Park, Desert Road, Oturere Stream], 14 Apr 1968 [8 Apr 1965], R.F.R. McNabb (PDD 26381). The specimen designated as type in the herbarium has very different collecting details to those published. There are seven other collections from under *N. fusca* and *N. menziesii* collected 14 Apr 1968 from Maruia, nearby to Springs Junction.

Lactarius maruiaensis R.F.R. McNabb, *N.Z. Jl Bot. 9*: 54-5, 1971
solitary under *Nothofagus fusca* and *N. menziesii*, Nelson, Maruia, Lake Daniels Track, 15 Apr 1968, R.F.R. McNabb (isotype PDD 26531). This is presumably the holotype, designated in error as isotype by McNabb.

Lactarius novae-zelandiae R.F.R. McNabb, *N.Z. Jl Bot. 9*: 52-3, 1971
solitary or gregarious under *Nothofagus menziesii*, Nelson, Karamea, Umere, 6 Jan 1968, R.F.R. McNabb (PDD 26527).

Lactarius sepiaceus R.F.R. McNabb, *N.Z. Jl Bot. 9*: 50-2, 1971
solitary or gregarious under *Nothofagus fusca* and *N. menziesii*, Nelson, Maruia, 23 Mar 1966, J.A. McRobb (PDD 26384).

Lactarius tawai R.F.R. McNabb, *N.Z. Jl Bot. 9*: 49-50, 1971
solitary or gregarious under *Nothofagus solandri*, Wellington, Tongariro National Park, Whakapapaiti Stream, 2 May 1967, R.F.R. McNabb (PDD 26387). Maori name for *Nothofagus* spp.

Lactarius umerensis R.F.R. McNabb, *N.Z. Jl Bot. 9*: 55-6, 1971
gregarious or occasionally caespitose under *Nothofagus menziesii*, Nelson, Karamea, [Umere], 8 Jan 1968, R.F.R. McNabb (PDD 26525).

Laricifomes maire G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 164*: 188-9 & 262, 1965
on decorticated wood of *Gymnelaea cunninghamii*, Auckland, Waitakere Ranges, Anawahata Road, 300 m, [Aug 1947, J.M. Dingley] (PDD 6657 [38093]). Maori name for host genus.

Lauterbachiella dicksoniafolia [dicksoniifolia] J.M. Dingley, *N.Z. Jl Bot. 10*: 84, 1972
hypophyllous on leaves of *Dicksonia squarrosa*, Auckland, Waitakere Ra., Sharp's Bush, 6 Oct 1965, J.M. Dingley (PDD 24774).

Lepiotula adusta E. Horak, *N.Z. Jl Bot. 18*: 186, 1980
on soil in forests (under *Dacrydium, Metrosideros, Dracophyllum*), Nelson, Whanganui Inlet, Mangarakau, 16 May 1968, E. Horak (PDD 27140, isotype ZT 68/454).

Lepiotula calcarata E. Horak, *N.Z. Jl Bot. 18*: 186, 1980
on rotting log of *Nothofagus* sp. and on soil, West Coast, S of Lake Hochstetter, 29 Mar 1968, E. Horak (PDD 27141, isotype ZT 68/227).

Leptosphaeria reidiana H. Sydow, *Ann. Mycol. 22*: 297, 1924
on dead stems of *Radicula* sp., Otago, Mt Judah, [4200 ft], 13 Dec 1921, W.D. Reid (PDD 1019). Named for collector, W.D. Reid.

Limacinia fraserae S.J. Hughes, *N.Z. Jl Bot. 4*: 352, 1966
on bark of *Leptospermum scoparium*, Auckland Province, Waitakere Range, Piha Stream, 11 Jun 1963, J.M. Dingley (PDD 21219, isotype DAOM 97369). Anamorph = *Capnophialophora fraserae* Hughes. Named for L.R. Fraser, Australian virologist.

Linochora aberrans H. Sydow, *Ann. Mycol. 22*: 312-3, 1924
on leaves of *Olearia* sp. (*O. insignis*?), Dunedin, [Botanic Gardens], 14 Dec 1919, G.H. Cunningham (PDD 1046).

Lopharia areolata G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 145*: 199 & 331, 1963
bark of dead branches of *Weinmannia racemosa*, Westland, Lake Mapouriki, 100 m, [Nov 1946, J.M. Dingley] (PDD 5100).

Lopharia ochracea G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 145*: 196 & 332, 1963
effused on bark of dead branches of *Pinus radiata*, Auckland, Waikato Heads, [Oct 1949, K. Harrow] (PDD 7076).

Lophodermium agathidis D.W. Minter & G. Hettige, *N.Z. Jl Bot. 21*: 39, 1983
on dead leaves and twigs of *Agathis australis*, Waitakere Ranges, Oratia, Kelly's Bush, 10 Nov [Dec] 1979, G. Hettige (PDD 43040, holotype IMI 259066, isotype K).

Lophodermium asteliae P.R. Johnston, *N.Z. Jl Bot. 27*: 248, 1989
on dead leaves of *Astelia trinervia*, Northland, Waima State Forest, Waiotemarama Bush Walk, 21 Oct 1987, P.R. Johnston (PDD 48000).

Lophodermium atrum P.R. Johnston, *N.Z. Jl Bot. 27*: 249, 1989
on dead leaves of *Dracophyllum matthewsii*, Coromandel, Little Barrier I., between summit track and Tirikakawa Stream, 15 Jun 1984, P.R. Johnston (PDD 49084).

Lophodermium brunneolum P.R. Johnston, *N.Z. Jl Bot. 27*: 251, 1989
on dead leaves of *Dracophyllum longifolium*, Stewart I., The Neck, Glory Cove, 5 May 1984, P.R. Johnston, [H. Donner] (PDD 45940, isotype IMI).

Lophodermium croesicum P.R. Johnston, *N.Z. Jl Bot. 27*: 253, 1989
on dead leaves of *Coprosma* cf. *cheesemanii*, Buller, vic. Blackball, Croesus Tr., between Garden Gully and bushline, 3 May 1985, P.R. Johnston, [G.J. Samuels, L.M. Kohn] (PDD 46946).

Lophodermium hauturuanum P.R. Johnston, *N.Z. Jl Bot. 27*: 255, 1989
on dead leaves of *Gahnia* sp., Coromandel, Little Barrier I., Shag Tr., 100 m, 15 Jun 1984, P.R. Johnston (PDD 46189).

Lophodermium inclusum P.R. Johnston, *N.Z. Jl Bot. 27*: 256-7, 1989
on dead leaves of *Gahnia* sp., Buller, vic. Greymouth, Pt. Elizabeth Walk, 1 May 1985, P.R. Johnston et al., [G.J. Samuels, L.M. Kohn] (PDD 46937).

Lophodermium irregulare P.R. Johnston, *N.Z. Jl Bot. 27*: 257, 1989
on dead leaves of *Archeria racemosa*, Coromandel, Little Barrier I., Summit Ridge, 13 Jun 1984 [1986], P.R. Johnston (PDD 46188, isotype IMI).

Lophodermium kaikawakae P.R. Johnston, *N.Z. Jl Bot. 27*: 258, 1989
on dead leaves of *Libocedrus bidwillii*, Taupo, Tongariro National Park, vic. Mangaturuturu Hut, 23 Mar 1984, P.R. Johnston, E.H.C. McKenzie (PDD 49345).

Lophodermium mahuianum P.R. Johnston, *N.Z. Jl Bot. 27*: 259-60, 1989
on dead leaves of *Nothofagus solandri* var.*cliffortioides*, Taupo, Tongariro National Park, vic. Mahuia campsite, 20 Nov 1984, P.R. Johnston, E.H.C. McKenzie (PDD 47022).

Lophodermium mangatepopense P.R. Johnston, *N.Z. Jl Bot. 27*: 261, 1989
on dead leaves of *Gaultheria colensoi*, Taupo, Tongariro National Park, lava flow behind Mangatepopo Hut, 25 Mar 1984, P.R. Johnston, E.H.C. McKenzie (PDD 46153, isotype IMI).

Lophodermium medium P.R. Johnston, *N.Z. Jl Bot. 27*: 261, 1989
on dead leaves of *Nothofagus menziesii*, Westland, Haast Pass, between Kiwi Flat and Cameron Flat, 12 Apr 1983, P.R. Johnston et al., [G.J. Samuels, R.H. Petersen, R.E. Beever] (PDD 44759).

Lophodermium multimatricum P.R. Johnston, *Mycotaxon 31*: 384, 1988
on fallen leaves of *Rubus cissoides*, Buller, vic. Murchison, Maruia Saddle, Warbeck Scenic Res., 16 Apr 1983, P.R. Johnston et al., [G.J. Samuels, R.E. Beever, R.H. Petersen] (PDD 46125 [46127]).

Lophodermium nigrofactum P.R. Johnston, *N.Z. Jl Bot. 27*: 264, 1989
on dead leaves of *Dracophyllum traversii*, Buller, Paparoa Ra., Croesus Tr., between Garden Gully Hut and top hut, 3 May 1985, P.R. Johnston et al., [G.J. Samuels, L.M. Kohn] (PDD 49330).

Lophodermium rectangulare P.R. Johnston, *N.Z. Jl Bot. 27*: 265, 1989
on dead leaves of *Dracophyllum longifolium*, Dunedin, vic. Dunedin City, Mt Cargill, 13 May 1984, P.R. Johnston (PDD 49322).

Lophodermium rubrum P.R. Johnston, *N.Z. Jl Bot. 27*: 267, 1989
on dead leaves of *Cortaderia splendens*, Northland, Poor Knights I., Aorangi, Fraser Landing, 30 Aug 1984, R.E. Beever (PDD 46154, isotype IMI).

Lophodermium tindalii P.R. Johnston, *N.Z. Jl Bot. 27*: 268, 1989
on dead leaves of *Dracophyllum longifolium*, Stewart I., Lee Bay-Garden Mound Tr., on shoreline, 4 May 1984, P.R. Johnston (PDD 45653).

Lophodermium unciniae P.R. Johnston, *N.Z. Jl Bot. 27*: 273, 1989
on dead leaves of *Uncinia* sp., Coromandel, Moehau, Te Hope Stream Tr., 28 Aug 1984, P.R. Johnston (PDD 46156).

Lycoperdon compactum G.H. Cunningham, *Trans. Proc. N.Z. Inst. 57*: 195, 1926
in small groups or caespitose on rotting wood on the forest floor, Wellington, York Bay, [25] Feb 1923, E.H. Atkinson [PDD 10140].

Macowanites carmineus R.F.R. McNabb, *N.Z. Jl Bot. 9*: 359-60, 1971
solitary or in small groups under *Nothofagus menziesii*, Nelson, Karamea, Umere, 8 Jan 1968, R.F.R. McNabb (PDD 26560).

Macrocystidia reducta E. Horak & Capellano in Horak, *Sydowia 33*: 53-4, 1980
on soil in forests, Canterbury, Banks Peninsula, Kaituna Valley, 24 Apr 1968, E. Horak (PDD 27160, isotype ZT 68/294).

Macrotyphula defibulata R.H. Petersen, *Bull. N.Z. Dep. scient ind. Res. 236*: 79 & 156, 1988
on leafy debris, usually broad-leafed, Waipoua Kauri Reserve, Big Kauri Tree Track, 23 Jun 1981, G.J. Samuels ([PDD 46633], holotype TENN).

Macrotyphula defibulata Petersen f. ***pallida*** R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 80 & 156, 1988
on leafy debris, usually *Dacrydium cupressinum*, Upper Hutt, Kaitoke Waterworks, 22 May 1982, R.H. Petersen ([PDD 46663], isotype TENN).

Macrotyphula rhizomorpha R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 80 & 156, 1988 [on dead leaves and twigs], FGNP, Gillespie's Beach, 9 May 1982, R.H. Petersen ([PDD 46648], isotype TENN).

Malacosphaeria scabrosa H. Sydow, *Ann. Mycol. 22*: 299, 1924
dead wood, Wellington, Weraroa, 3 Sep 1919, G.H. Cunningham (PDD 1007).

Marasmius inversus G. Massee, *Trans. Proc. N.Z. Inst. 31*: 343-4, 1898 (1899)
on slender branches and twigs, lying on the ground, W. Colenso b563 ([PDD 41962], holotype K).

Melampsora novae-zelandiae G.H. Cunningham, *Trans. Proc. N.Z. Inst. 59*: 495, 1929 (1928)
Euphorbia glauca, Westland, Brighton, Seal Rock, coast, Feb 1928, G.H. Cunningham [PDD 3386].

Melanocephala cupulifera S.J. Hughes, *N.Z. Jl Bot. 17*: 168, 1979
on dead wood and bark of *Tetrapathaea tetrandra*, Auckland Prov., Cornwallis, 3 Jan 1963, [J.M. Dingley] (PDD 20390, isotype DAOM 96163).

Melanotus citrisporus E. Horak, *Persoonia 9*: 315, 1977
on dry and half-decomposed leaves and culms of *Astelia nervosa*, Mt Egmont National Park, Stanford Lodge, 12 Jun 1968, E. Horak (PDD 27134, isotype ZT 68/531).

Melanotus vorax E. Horak, *Persoonia 9*: 319-20, 1977
on decomposing leaves of *Cortaderia, Phormium,* and ferns (*Dicksonia, Cyathea*), Canterbury, Mt Grey, Kowai River, 30 Dec 1968, E. Horak (PDD 27135, isotype ZT 68/688).

Meliolina novae-zealandiae C.G. Hansford, *Proc. Linn. Soc. N.S.W. 79*: 99-100, 1954
in leaves of *Metrosideros excelsa*, Auckland, Rangitoto I., [18] Jul 1950, J.M. Dingley [PDD 12088].

Meloderma dracophylli P.R. Johnston, *Mycotaxon 33*: 424, 1988
on dead, fallen leaves of *Dracophyllum longifolium*, Gisborne, Urewera National Park, near Lake Waikaremoana, Puniho Swamp, 29 May 1983, P.R. Johnston (PDD 44481).

Menispora uncinata S.J. Hughes & W.B. Kendrick, *N.Z. Jl Bot. 6*: 330, 1968
on rotten wood of *Coriaria arborea*, Auckland Prov., Waitakere Range, Upper Piha Valley, [Centennial Track], 2 May 1963, J.M. Dingley, S.J. Hughes (PDD 20956, isotype DAOM 109721a).

Menisporopsis novae-zelandiae S.J. Hughes & W.B. Kendrick, *N.Z. Jl Bot. 6*: 369, 1968
on fallen leaves of *Beilschmiedia tarairi*, Auckland Prov., Papakura, Kirk's Bush, 15 Jan 1963, S.J. Hughes (PDD 25761, isotype DAOM 96409c).

Merulius miniatus E.M. Wakefield, *Bull. misc. Inf. R. bot. Gdns Kew 1931*: 201, 1931
on dead twigs on the forest floor [*Nothofagus fusca*], Wellington, York Bay, [27] Jul 1923, E.J. Butler (PDD 1218).

Merulius nothofagi G.H. Cunningham, *Bull. Plant Dis. Div. N.Z. Dep. scient. ind. Res. 83*: 7-8, 1950
solitary or caespitose on bark of fallen branches of *Nothofagus solandri*, Otago, Routeburn Valley, [near Lake Whakatipu], Feb 1948, J.M. Dingley [PDD 6849].

Mesophellia novae-zelandiae G.H. Cunningham, *N.Z. Jl Sci. Technol. 22*: 124b, 1940
on ground, Auckland Province, Hamilton, [22 Oct 1932], E.J. Cullen [PDD 8687].

Metacapnodium dingleyae S.J. Hughes, *N.Z. Jl Bot 19*: 213, 1981
on corticated trunks of *Podocarpus spicatus*, Banks Peninsula, [Price's Bush, near Little River], 13 May 1963, S.J. Hughes (PDD 21096, isotype DAOM 106368b). Synanamorphs = *Antennaria arnottii* (Hooker) Berkeley, *Capnobotrys dingleyae* S.J. Hughes, *Capnophialophora* sp.

Microcera orthospora H. Sydow, *Ann. Mycol. 22*: 317, 1924
on living wood of *Nothofagus* sp. [*fusca*], Wellington, York Bay, 8 Mar 1920, E.H. Atkinson (PDD 1011).

Microdochium passiflorae G.J. Samuels, E. Müller & O. Petrini, *Mycotaxon 28*: 474-5, 1987
on dead stem of *Passiflora edulis*, Auckland, Mt Albert, Mt Albert Research Centre, 1980,

G.I. Robertson (PDD 47874). Teleomorph = *Monographella passiflorae* Samuels, Müller & Petrini.

Microthyriella phaeospora C.G. Hansford, *Proc. Linn. Soc. N.S.W. 79*: 112, 1954
Knightia excelsa, Wellington, Kapiti I., Nov 1936, H.H. Allen [PDD 6788a]).

Milesia lindsayae S.D. Baker (anamorph only), *Trans. R. Soc. N.Z. 83*: 453-4, 1956
Lindsaya cuneata, Wellington, near Upper Hutt, [9] Mar 1953, A.J. Healy (PDD 14069). Anamorph = *Uredo lindsayae* P. Hennings.

Milesina histiopteridis G.H. Cunningham (anamorph only), *Trans. Proc. N.Z. Inst. 55*: 31 & 52, 1924
on fronds of *Histiopteris incisa* (=*Pteris incisa*), Wellington, Kelburn, 120 m, 17 Sep 1922 [14 Aug 1922], E.H. Atkinson, G.H. Cunningham (PDD 772). Anamorph = *Uredo histiopteridis* Hiratsuka.

Mollisia coprosmae R.W.G. Dennis, *Kew Bull. 15*: 293, 1962
on the upper side of branches of *Coprosma foetidissima*, Westland, Harihari, 8 Nov 1954, J.M. Dingley (PDD 19049).

Monographella passiflorae G.J. Samuels, E. Müller & O Petrini, *Mycotaxon 28*: 474-5, 1987
on dead stem of *Passiflora edulis*, Auckland, Mt Albert, Mt Albert Research Centre, 1980, G.I. Robertson (PDD 47874). Anamorph = *Microdochium passiflorae* Samuels, Müller & Petrini.

Monotosporella setosa (Berk. & Curt.) Hughes var. ***macrospora*** S.J. Hughes, *N.Z. Jl Bot. 16*: 338, 1978
on rotten wood, Wellington Prov., Tongariro National Park, Silica Springs Track, Whakapapanui Stream, 5 Mar 1963, S.J. Hughes (PDD 30415, isotype DAOM 109678).

Multiclavula samuelsii R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 85 & 156, 1988
on soggy rotten log of *Nothofagus*, perhaps associated with a slime mould plasmodium, Nelson, Graham River Valley, Haycock's [Hancock's] Bush, 15 May 1982, G.J. Samuels [PDD 46649], isotype TENN).

Mycena globuliformis B.P. Segedin, *N.Z. Jl. Bot. 29*: 44-5, 1991
gregarious, on dead wood in mixed podocarp-dicotyledonous forest, Taupo, on track to Lake Rotopounamu, 30 May 1980, B.P. Segedin (PDD 56709).

Mycena helminthobasis Singer var. ***novaezelandiae*** E. Horak, *Aust. J. Bot. Suppl. Ser. 10*: 32, 1983
rotten wood in mixed rainforests dominated by *Nothofagus* (PDD 27167).

Mycena lividorubra B.P. Segedin, *N.Z. Jl. Bot. 29*: 48-9, 1991
on decaying wood in kauri (*Agathis australis*) forest, N Auckland, Huapai, University of Auckland Reserve, 16 May 1980, B.P. Segedin (PDD 56704).

Mycena mamaku B.P. Segedin, *N.Z. Jl. Bot. 29*: 46-7, 1991
among matted aerial roots at the base of trunks of black tree fern, *Cyathea medullaris*, N Auckland, Warkworth, Logue's Bush, 3 Jun 1986, M. Laird (PDD 56752). Maori name for host plant.

Mycena oratiensis B.P. Segedin, *N.Z. Jl. Bot. 29*: 49-50, 1991
on wood in kauri (*Agathis australis*) forest, Auckland, Oratia, Kelly's Rd., University of Auckland Reserve, 27 May 1976, B.P. Segedin (PDD 56705).

Mycena podocarpi B.P. Segedin, *N.Z. Jl. Bot. 29*: 51-2, 1991
caespitose on wood in mixed podocarp, *Weinmannia, Elaeocarpus* forest, Taupo, track to Lake Rotopounamu, 22 May 1973, B.P. Segedin, G.M. Taylor (PDD 56706).

Mycena rubroglobulosa B.P. Segedin, *N.Z. Jl. Bot. 29*: 53, 1991
among mosses in soil and on wood in podocarp forest, Taupo, Pureora forest, 23 May 1983, B.P. Segedin (PDD 56707).

Mycena vinaceipora B.P. Segedin, *N.Z. Jl. Bot. 29*: 60-1, 1991
solitary on the ground in mixed podocarp-dicotyledonous forest, Auckland, Waitakere Ra., Atkinson's Reserve, 19 Jun 1976, B.P. Segedin (PDD 56708).

Mycobonia disciformis G.H. Cunningham, *Trans. R. Soc. N.Z. 83*: 635-6, 1956
scattered or gregarious on bark of living trunks of *Rhopalostylis sapida*, Auckland, Henderson Valley, Sharp's Bush, Apr [5 May] 1952, S.D. Baker (PDD 11491).

Mycocalicium schefflerae G.J. Samuels, D.E. Buchanan, *N.Z. Jl Bot. 21*: 163-4, 1983
on bark of living tree of *Schefflera digitata*, Northland, Whangarei, 17 Mar 1980 (PDD 42005, isotype NY, ZT).

Mycocentrospora camelliae F.C. Deighton, *Mycol. Pap. 151*: 6, 1983
on living leaves of *Camellia* sp., Hawera, 19 Dec 1967, D.B. Parker (LEV 1858 [PDD 50610], isotype IMI 131193).

Mycosphaerella coacervata H. Sydow, *Ann. Mycol. 22*: 296, 1924
on leaves of *Coprosma* sp. [*robusta*], Wellington, Botanical Gardens, 18 Oct 1920, E.H. Atkinson (PDD 970).

Mycosphaerella cunninghamii H. Sydow, *Ann. Mycol. 22*: 295, 1924
on leaves of *Rubus australis*, Southland, Riverton, 3 [2] Nov 1882, T. Kirk (PDD 966). Named for G.H. Cunningham, New Zealand mycologist.

Mycosphaerella spissa H. Sydow, *Ann. Mycol. 22*: 296, 1924
on living leaves of *Coprosma robusta* [*repens*], Wellington, York Bay, 6 Oct 1922, E.H. Atkinson (PDD 1069).

Myxosporium hoheriae J.D. Atkinson, *N.Z. Jl Sci. Technol. 22A*: 120, 1940
on living branch of *Hoheria populnea, H. sexstylosa,* and *Plagianthus betulinus* [on *Plagianthus lyallii*, Invercargill, 6 Jun 1923, C.M. Smith] [PDD 1236]. Teleomorph = *Nectria hoheriae* J.M. Dingley.

Nectria arenuloides G.J. Samuels, *N.Z. Jl Bot. 14*: 254-5, 1976
on rachis of *Cyathea dealbata*, Auckland Province, Waitemata County, Waitakere Ranges, Huia Rd., Kakamatua Stream, 5 Apr 1974, G.J. Samuels, W.B. Kendrick (PDD 32560). Anamorph = *Acremonium* sp.

Nectria austroradicicola G.J. Samuels & D. Brayford, *Mycol. Res. 94*: 441, 1990
on bark of indet. tree, Westland, Westland Natl. Park, vic. Franz Josef, track to Lake Wombat, 10 Apr 1983, G.J. Samuels, R.H. Petersen (PDD 46395). Anamorph = *Cylindrocarpon austrodestructans* Brayford & Samuels.

Nectria chaetopsinae G.J. Samuels, *Mycotaxon 22*: 18-20, 1985
on decaying leaf of *Collospermum hastatum*, Gisborne, Urewera National Park, Lake Waikaremoana, vic. park headquarters, track to Lake Ruapani, 31 May 1983, G.J. Samuels, P.R. Johnston, T. Matsushima, A.Y. Rossman (PDD 44237, isotype NY). Anamorph = *Chaetopsis* cf. *fulva* Rambelli.

Nectria chaetopsinae-pencillatae G.J. Samuels, *Mycotaxon 22*: 24-6, 1985
on bark of *Beilschmiedia tawa*, Auckland, Waitemata City, Waitakere Ranges, Piha Rd., Marguerite Track, 21 Mar 1977, G.J. Samuels (PDD 44235, isotype ATCC 56205, ICMP 7801). Anamorph = *Chaetopsina penicillata* G.J. Samuels.

Nectria coprosmae J.M. Dingley, *Trans. Proc. R. Soc. N.Z. 79*: 200-1, 1951
Coprosma grandifolia, Auckland, Waitakere Ra., Anawhata Rd., [16] Aug 1947, J.M. Dingley [PDD 7472]. Anamorph = *Cylindrocarpon destructans* (Zinssm.) Scholten var. *coprosmae* (Booth) Brayford & Samuels.

Nectria corynospora G.J. Samuels, *N.Z. Jl Bot. 16*: 78-81, 1978
on dead leaf of *Phormium tenax*, Auckland, Waitemata County, Piha, Waitakere Ranges, vic. Piha, Marowhara Loop Track, 17 Dec 1974, J.M. Dingley, [S. Francis, G.J. Samuels] (PDD 34934). Anamorph = *Cylindrocarpon* sp.

Nectria cyathea J.M. Dingley, *Trans. R. Soc. N.Z. 83*: 652, 1956
on stipes of *Cyathea medullaris*, Auckland, Waitakere Ra., Anawhata Rd., Apr 1948, [J.M. Dingley] (PDD 6201).

Nectria dentifera G.J. Samuels, *N.Z. Jl Bot. 14*: 253-4, 1976
bark of *Dacrydium cupressinum*, Westland Province, Westland County, Ianthe State Forest

(S.F. 42), vic. Lake Ianthe, 30 Apr - 1 May 1974, G.J. Samuels (PDD 32565). Anamorph = *Acremonium* sp.

Nectria egmontensis J.M. Dingley, *Trans. R. Soc. N.Z. 83*: 653, 1956
Pseudowintera colorata, Taranaki, Mt Egmont, 4000 ft, [24] Mar 1951, J.M. Dingley (PDD 10906).

Nectria fragilis J.M. Dingley, *Trans. Proc. R. Soc. N.Z. 79*: 187, 1951
Pseudowintera colorata, Otago, Lower Hollyford, [5] Jan 1950, J.M. Dingley [PDD 7476].

Nectria freycinetii G.J. Samuels, *N.Z. Jl Bot. 14*: 243-4, 1976
on bases of dead leaves of *Freycinetia banksii*, Auckland Province, Thames County, Coromandel Forest Park, Kauaeranga Valley, vic. Thames, 27 Aug 1974, J.M. Dingley, [G.J. Samuels, S. Haydon] (PDD 32577). Anamorph = *Acremonium* sp.

Nectria grammicosporopsis G.J. Samuels, *Brittonia 40*: 318, 1988
on bark of dying and nearly dead trees, Southland, Catlins State Forest Park, Lake Wilkie, 18 Apr 1985, G.J. Samuels, L.M. Kohn (PDD 50042, isotype NY). Anamorph = *Clonostachys* sp.

Nectria hauturu J.M. Dingley, *Trans. Proc. R. Soc. N.Z. 79*: 185, 1951
Carmichaelia sp., Auckland, Little Barrier I., Dec 1947 [20 Nov 1947], J.M. Dingley [PDD 6209]. Maori name for the type locality.

Nectria hoheriae J.M. Dingley, *Mem. N.Y. bot. Gdn 49*: 208, 1989
Plagianthus regius, Banks Peninsula, 7 Apr 1958, J.M. Dingley (PDD 21879). Anamorph = *Myxosporium hoheriae* J.D. Atkinson.

Nectria kowhai J.M. Dingley, *Trans. R. Soc. N.Z. 83*: 654-5, 1956
Edwardsia microphylla, Auckland, Piha, [15] Aug 1953, [J.M. Dingley] (PDD 12800). Maori name for host plant.

Nectria macrarenula G.J. Samuels, *Mem. N.Y. bot. Gdn 59*: 83, 1990
on *Rhopalostylis sapida*, Auckland, Waitemata City, Waitakere Ranges, Cascades, 7 May 1981, G.J. Samuels, P.R. Johnston, E. Horak (PDD 45718, isotype NY). Anamorph = *Acremonium* sp.

Nectria manuka J.M. Dingley, *Trans. Proc. R. Soc. N.Z. 79*: 183, 1951
Leptospermum ericoides [*scoparium*], Auckland, Mt Albert, Sep 1948, D.W. McKenzie [PDD 7490]. Maori name for host plant.

Nectria multiloculata G.J. Samuels, *N.Z. Jl Bot. 16*: 78, 1978
on dead leaf of *Astelia* sp., Auckland, Waitemata County, Waitakere Ranges, Lucy Cranwell Track, vic. Kitekite Stream, 30 May 1973, J.M. Dingley et al., [G.J. Samuels, S. Haydon] (PDD 31786). Anamorph = *Cylindrocarpon* sp.

Nectria multiseptata G.J. Samuels, *N.Z. Jl Bot. 16*: 77, 1978
on leaves of *Phormium tenax*, Auckland, Waitakere Ranges, vic. Piha, Marowhara Loop Track, 17 Dec 1974, J.M. Dingley, G.J. Samuels, S. Francis (PDD 34937). Anamorph = *Cylindrocarpon* sp.

Nectria nothoepisphaeria G.J. Samuels in Samuels et al., *Mycol. Pap.*: 1991 (in press)
on ? *Leptosphaeria* sp. on *Ripogonum scandens*, Taranaki, New Plymouth, Barrett Domain, 22 Apr 1973, G.J. Samuels, C.E. Samuels, B. van Fleet, S. van Fleet (PDD 30792). Anamorph = *Fusarium* cf. *ciliatum* Link.

Nectria pertusoides G.J. Samuels, *N.Z. Jl Bot. 14*: 241-2, 1976
on dead leaves of *Cordyline indivisa*, Taranaki Province, Mt Egmont National Park, Stratford Mountain House, 2 Oct 1973, G.J. Samuels, C.S. Samuels (PDD 32032). Anamorph = *Acremonium* sp.

Nectria phormiicola G.J. Samuels, *N.Z. Jl Bot. 14*: 244-6, 1976
at the base of dead leaves of *Phormium tenax*, Auckland Province, Waitemata County, Waitakere Ranges, vic. Piha, Marowhara Loop Track, 17 Dec 1974, J.M. Dingley, [G.J. Samuels, S. Francis] (PDD 32684 [32686]). Anamorph = *Acremonium* sp.

Nectria pinea J.M. Dingley, *Trans. Proc. R. Soc. N.Z. 79*: 198-9, 1951

Pinus radiata, Rotorua, Whakarewarewa, Sep 1949, G.B. Rawlings [PDD 7510].

Nectria plagianthi J.M. Dingley, *Trans. Proc. R. Soc. N.Z. 79*: 196, 1951

Plagianthus betulinus, Otago, Upper Hollyford Valley, Feb 1950 [30 Dec 1949], J.M. Dingley [PDD 10916].

Nectria pseudoflavoviridis R. Lowen & G.J. Samuels in Samuels et al., *Mycol. Pap.*: 1991 (in press)

on rachis of *Rhopalostylis sapida*, Auckland, Titirangi, Titirangi Beach Reserve, 18 Sep 1980, G.J. Samuels, P.R. Johnston (PDD 41420). Anamorph = *Fusarium* cf. *melanochlorum* (Casp.) Sacc.

Nectria pulverulenta J.M. Dingley, *Trans. R. Soc. N.Z. 83*: 657, 1956

Hoheria populnea, Auckland, Titirangi, [Wood's Bay, 15] Mar 1947, J.M. Dingley (PDD 7465).

****Nectria radicicola*** var. ***macroconidialis*** G.J. Samuels & D. Brayford, *Mycol. Res. 94*: 440, 1990

on leaves of *Collospermum hastatum*, Waikato, vic. Te Awamutu, Mt Pirongia, track to Mahaukura, 27 Aug 1979, G.J. Samuels, C. Samuels (PDD 40005, holotype IMI 313230). Anamorph = *Cylindrocarpon macroconidialis* Brayford & Samuels.

Nectria ruapehu J.M. Dingley, *Trans. Proc. R. Soc. N.Z. 79*: 186, 1951

Coprosma pseudocuneata, Wellington, Mt Ruapehu, Mangatorutoru Stream, Mar 1948, J.M. Dingley [PDD 7534].

Nectria tawa J.M. Dingley, *Trans. Proc. R. Soc. N.Z. 79*: 199-200, 1951

Beilschm[i]edia tawa, Auckland, Titirangi, May 1940 [1948], J.M. Dingley [PDD 7556].

Nectria westlandica J.M. Dingley, *Trans. Proc. R. Soc. N.Z. 79*: 201, 1951

Olearia avicenniaefolia, Westland, Waiho [Weheka], Nov 1946 [1948, J.M. Dingley] [PDD 5129].

Nectriopsis hyperbiota G.J. Samuels, *Mem. N.Y. bot. Gdn 48*: 38, 1988

on *Nectria pseudotrichia* on *Dysoxylum spectabile*, Auckland, Waitemata City, Waitakere Ranges, off Anawhata Rd., Apr 1948, J.M. Dingley (PDD 7509, isotype NY).

****Nectriopsis lasiodermopsis*** G.J. Samuels, *Mem. N.Y. bot. Gdn 48*: 32-3, 1988

on old *Nectria* cf. *ochroleuca*, Gisborne, Urewera National Park, Lake Waikaremoana, Ngamoko Track, 21 May 1981, G.J. Samuels, E. Horak, P.R. Johnston, R.H. Petersen (PDD 49502, isotype NY). Anamorph = *Acremonium* sp.

Nectriopsis sibicola G.J. Samuels, *Mem. N.Y. bot. Gdn 48*: 37-8, 1988

on *Nectria* sp. on *Coprosma foetidissima*, Buller, 7 km S of Reefton, Tawhai Forest, 22 May 1983, G.J. Samuels, T. Matsushima, A.Y. Rossman (PDD 46339). Anamorph = *Acremonium*-like.

Nectriopsis sororicola G.J. Samuels, *Mem. N.Y. bot. Gdn 48*: 33-7, 1988

on perithecia of *Nectria discophora*, Auckland, Waitemata City, Titirangi, Titirangi Beach Reserve, 10 Dec 1980, G.J. Samuels, P.R. Johnston, M. Rattray (PDD 41423). Anamorph = *Acremonium*-like.

Neohygrocybe innata E. Horak, *Beih. Nova Hedwigia 43*: 126-7, 1973

amongst litter of *Dacrydium cupressinum, Metrosideros umbellata, Quintinia,* etc., Westcoast, Ngahere, Red Jack Valley, 21 Mar 1968, E. Horak (PDD 27076, isotype ZT 68/199).

Neohygrocybe squarrosa E. Horak, *Beih. Nova Hedwigia 43*: 127-9, 1973

on soil under *Dacrydium, Podocarpus, Weinmannia,* etc., Stewart I., Paterson Inlet, Ulva I., 23 Mar 1969, E. Horak (PDD 27077, isotype ZT 69/164).

Nivatogastrium baylisianum E. Horak, *N.Z. Jl Bot. 9*: 483-5, 1971

in tussock grassland and herbfield, 3000-40000 ft, Central Otago, Rock and Pillar Range, Apr 1969, G.T.S. Baylis (PDD 27005, isotype ZT 69/258). Named for collector, Professor G.T.S. Baylis).

Nivatogastrium lignicola E. Horak, *N.Z. Jl Bot. 9*: 481, 1971

on rotten wood in forest of *Podocarpus, Dacrydium, Griselinia, Coprosma, Pittosporum,* etc., Dunedin, Filter Station, 30 May 1968, E. Horak, G.T.S. Baylis (PDD 27003, isotype ZT [68/519]).

Nivatogastrium sulcatum E. Horak, *N.Z. Jl Bot. 9*: 483, 1971
among mosses on soil under *Nothofagus fusca* and *N. menziesii*, Urewera National Park, beside track to Lake Waikareiti, 25 Jun 1968, E. Horak (PDD 27004, isotype ZT [68/593]).

Octaviania redolens G.H. Cunningham, *N.Z. Jl Sci. Technol. 23*: 172b, 1942
[among debris on the forest floor], Auckland, Te Aroha 100 m, [May 1940], G.H. Cunningham [PDD 10141].

Odontia capitata G.H. Cunningham, *Trans. R. Soc. N.Z. 86*: 74-5, 1959
effused on bark of dead branches of *Carpodetus serratus*, Auckland, Hunua Range, Moumoukai Valley, 800 ft, Jan 1951, J.M. Dingley (PDD 17828).

Odontia columellifera G.H. Cunningham, *Trans. R. Soc. N.Z. 86*: 84-5, 1959
effused on bark and decorticated wood of dead branches and stems of *Leptospermum scoparium*, Auckland, Campbell's Bay, [19] Nov 1955, E.E. Chamberlain (PDD 18099).

Odontia flexiblis G.H. Cunningham, *Trans. R. Soc. N.Z. 86*: 99-100, 1959
adnate on bark of dead stems of *Freycinetia banksii*, Wellington, Lake Papaetonga [Papaitonga], 50 ft, [11] May 1956, G.H. Cunningham (PDD 17897).

Odontia fragilis G.H. Cunningham, *Trans. R. Soc. N.Z. 86*: 100-1, 1959
effused on bark or decorticated wood of dead branches of *Beilschmiedia tawa*, Auckland, Waitakeres, Cascade Park, 750 ft, [3] Apr 1954, S.D. Baker (PDD 17916).

Odontia lutea G.H. Cunningham, *Trans. R. Soc. N.Z. 86*: 82-3, 1959
effused on bark or more frequently decorticated wood of dead branches and trunks of *Dysoxylum spectabile* lying upon the forest floor, Auckland, Waitakeres, Mountain Road, 700 ft, [21] Mar 1954, J.M. Dingley (PDD 17925).

Odontia nothofagi G.H. Cunningham, *Trans. R. Soc. N.Z. 86*: 88-9, 1959
effused on bark or decorticated wood of dead trunks of *Nothofagus menziesii*, Otago, Woodlaw State Forest, Nov 1946, G.B. Rawlings (PDD 7281).

Odontia novae-zealandiae G.H. Cunningham, *Trans. R. Soc. N.Z. 86*: 99, 1959
effused on bark and decorticated wood of dead branches of *Beilschmiedia tawa*, Auckland, Lake Rotoehu, 1200 ft, [9] Oct 1955, G.H. Cunningham (PDD 17968).

Odontia oblongospora G.H. Cunningham, *Trans. R. Soc. N.Z. 86*: 95-6, 1959
effused on decayed decorticated wood of *Agathis australis*, Auckland, Waitakeres, Upper Piha Valley, 900 ft, [15] Aug 1953, J.M. Dingley (PDD 17981).

Odontia oleifera G.H. Cunningham, *Trans. R. Soc. N.Z. 86*: 102-3, 1959
effused on bark and decorticated wood of dead branches of *Beilschmiedia tawa*, Wellington, Pohangina Valley, Totara Reserve, 250 ft, [12] May 1956, G.H. Cunningham (PDD 17901).

Odontia stratosa G.H. Cunningham, *Trans. R. Soc. N.Z. 86*: 78-9, 1959
effused on bark and decorticated wood of dead branches and stems of *Macropiper excelsum*, Wellington, Lake Papaetonga [Papaitonga], 50 ft, [11] May 1956, G.H. Cunningham (PDD 18076).

Odontia subscopinella G.H. Cunningham, *Trans. R. Soc. N.Z. 86*: 72-3, 1959
effused on bark and decorticated dead wood of branches and stems of *Leptospermum ericoides*, Auckland, Lake Taupo, Hatepe, 1300 ft [650 ft], [26] Mar 1953, J.M. Dingley (PDD 17992).

Odontia tessellata G.H. Cunningham, *Trans. R. Soc. N.Z. 86*: 89-90, 1959
effused on bark or decorticated wood of dead stems of *Weinmannia racemosa*, Otago, Stewart I., Ulva Islet, [18] Feb 1954, J.M. Dingley (PDD 18041).

Odontia verruculosa G.H. Cunningham, *Trans. R. Soc. N.Z. 86*: 80, 1959
effused on bark and decorticated wood of dead branches of *Beilschmiedia tawa*, Auckland, Lake Rotoehu, 1200 ft, [21] Jun 1957, G.H. Cunningham (PDD 18106).

Odontia vesiculosa G.H. Cunningham (nom. illegit.), *Trans. R. Soc. N.Z. 86*: 75, 1959 effused on bark or decorticated dead branches and stems of *Nothofagus menziesii*, Otago, Alton Valley, Tuatapere, 600 ft, [23] Feb 1954, J.M. Dingley (PDD 18112).

Oidium hardenbergiae H.J. Boesewinkel, *Revue Mycol. 41*: 497, 1977
on living leaves and stems of *Hardenbergia monophylla*, Waitakere, Oct 1974, [H.J. Boesewinkel] (PDD 37132).

Oidium helichrysi H.J. Boesewinkel, *Revue Mycol. 41*: 495, 1977
on living leaves and stems of *Helichrysum bracteatum*, Waitakere, Aug 1975, [H.J. Boesewinkel] (PDD 37131).

Ophiocapnocoma batistae S.J. Hughes, *N.Z. Jl Bot. 5*: 128, 1967
on trunk of *Nothofagus solandri* var. *cliffortiodes*, Canterbury Province, Craigieburn Range, Broken River, near Enys, 16 May 1963, J.M. Dingley (PDD 25074, isotype DAOM 105925a). Anamorph = *Capnophialophora* sp. Named for A.C. Batista, Brazilian mycologist.

Orbilia cunninghamii H. Sydow, *Ann. Mycol. 22*: 308, 1924
on dead wood, Wellington, Weraroa, 16 Sep 1919, G.H. Cunningham (PDD 1052). Named for G.H. Cunningham, New Zealand mycologist.

Orbiliopsis callistea H. Sydow, *Ann. Mycol. 22*: 308, 1924
on living leaves of *Veronica subalpina*, Otago, Lake Harris Track, 6 May 1921, W.D. Reid (PDD 996).

Oxydothis rhopalostylidis G.J. Samuels & A.Y. Rossman, *Mycotaxon 28*: 469-71, 1987
on leaf midrib of *Rhopalostylis sapida*, Northland, Hokianga County, vic. Mangamuka Bridge, Omahuta State Forest, at forest headquarters, 11 May 1983, G.J. Samuels (PDD 45779, isotype NY).

Oxydothis selenosporellae G.J. Samuels, A.Y. Rossman, *Mycotaxon 28*: 467, 1987
on leaf midrib of *Rhopalostylis sapida*, Auckland, Waitakere Ranges, Waitemata City, Huia, Mill Bay, 3 May 1983, G.J. Samuels, T. Matsushima, R.H. Petersen (PDD 46266, isotype NY). Anamorph = *Selenosporella* sp.

Parasphaeria contraria H. Sydow, *Ann. Mycol. 22*: 297-8, 1924
on leaves of *Aciphylla lyallii*, Otago, Lake Harris Track, 6 May 1921, W.D. Reid (PDD 1058).

Parodiella maculata G. Massee, *Kew Bull. 1898*: 133, 1898
on the leaf of an undetermined plant, W. Colenso b1496 [PDD 40798, holotype K].

Patellaria torulispora Phillips in M.C. Cooke, *Grevillea 15*: 16, 1886
on dead bark, W. Colenso [b144] [PDD 40218, holotype K, isotype NY].

Paurocotylis pila M.J. Berkeley in J.D. Hooker, *Flora Novae-Zelandiae 2*: 188, 1855
on ground, Te Hawera, W. Colenso 2181 [PDD 40772, holotype K].

Paxillus aurantiacus R.F.R. McNabb, *N.Z. Jl Bot. 7*: 357, 1969
gregarious or caespitose under *Nothofagus menziesii* and *N. solandri* var. *cliffortioides*, Canterbury Province, near Cass, 31 Mar 1968, M.J. Noonan (PDD 26294).

Paxillus nothofagi R.F.R. McNabb, *N.Z. Jl Bot. 7*: 354, 1969
gregarious or caespitose under *Nothofagus solandri*, Wellington Province, Horopito, 1 May 1967, R.F.R. McNabb (PDD 25904).

Paxillus squarrosus R.F.R. McNabb, *N.Z. Jl Bot.7* : 355, 1969
gregarious or caespitose under *Nothofagus fusca* and *N. menziesii*, Nelson Province, Springs Junction, Lake Daniels Track, 14 Apr 1968, R.F.R. McNabb (PDD 26292).

Pellicularia otagensis G.H. Cunningham, *Trans. R. Soc. N.Z. 81*: 324-6, 1953
effused on decorticated decaying wood, Otago, Dunedin, Morrison's Creek, 500 ft, [27] Jun 1952, G.T.S. Baylis (PDD 11581).

Pellicularia scabrida G.H. Cunningham, *Trans. R. Soc. N.Z. 81*: 326, 1953
effused on bark or decorticated decaying wood of *Nothopanax arboreum*, Taranaki, Mt Egmont, [Veronica Track], 4500 ft, Feb 1952, G.H. Cunningham (PDD 11296).

Pellicularia zealandica G.H. Cunningham, *Trans. R. Soc. N.Z. 81*: 322, 1953
effused on bark of dead branches of *Podocarpus spicatus*, Auckland, Te Whaiti, 2000 ft, [22] Jun 1951, J.M. Dingley (PDD 11449).

Peniophora cerebrosa G.H. Cunningham, *Trans. R. Soc. N.Z. 83*: 270-1, 1955
effused on bark or decorticated wood of *Nothofagus fusca*, Westland, Staircase Creek, 2000 ft, [29] Nov 1952, S.D. Baker (PDD 11871).

Peniophora coprosmae G.H. Cunningham, *Trans. R. Soc. N.Z. 83*: 266-7, 1955
effused on bark or decorticated wood of dead branches of *Coprosma robusta*, Wellington, Lake Papaetonga [Papaitonga], 50 ft, Oct 1930, G.H. Cunningham (PDD 3719).

Peniophora crustosa M.C. Cooke, *Grevillea 8*: 56, 1879
on bark, Waitaki [PDD 35807, holotype K].

Peniophora erucaeforma G.H. Cunningham, *Trans. R. Soc. N.Z. 83*: 275-6, 1955
effused on bark of dead branches of *Pittosporum eugenioides*, Auckland, Mt Pihanga, 2000 ft, [23] Oct 1949, J.M. Dingley (PDD 7363).

Peniophora gladiola G.H. Cunningham, *Trans. R. Soc. N.Z. 83*: 283-5, 1955
effused on bark of dead branches of *Brachyglottis repanda*, Auckland, Taneatua Reserve, 50 ft, [23] May 1952, G.H. Cunningham (PDD 11484).

Peniophora hastata G.H. Cunningham (non *P. hastata* Litsch., 1928), *Trans. R. Soc. N.Z. 83*: 285, 1955
effused in bark crevices on dead branches of *Griselinia lucida*, Auckland, Piha, Glen Esk Valley, [12] May 1951, J.M. Dingley (PDD 11442). Nom. nov. = *Tubulicrinis hastata* G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 145*: 136, 1963.

Peniophora inconstans G.H. Cunningham, *Trans. R. Soc. N.Z. 83*: 263-4, 1955
effused on bark or decorticated dead wood of *Schefflera digitata*, Auckland, Coromandel Peninsula, Whitianga Road, 750 ft, [28] Aug 1954, J.M. Dingley (PDD 13825).

Peniophora nikau G.H. Cunningham, see *Peniophora sororia.*

Peniophora sacrata G.H. Cunningham, *Trans. R. Soc. N.Z. 83*: 274-5, 1955
effused on bark or decorticated dead wood of *Leptospermum scoparium*, Auckland, Kawhia Harbour, coast, [18] Jan 1953, J.D. Atkinson (PDD 11845).

Peniophora scintillans G.H. Cunningham, *Trans. R. Soc. N.Z. 83*: 268-10, 1956
effused on bark of dead branches and twigs of *Laurelia novae-zealandiae*, Auckland, Mt Te Aroha, 1200 ft, [9] Sep 1954, G.H. Cunningham (PDD 13828).

Peniophora sororia G.H. Cunningham (non *P. sororia* Bourd. & Galz., 1912), *Trans. R. Soc. N.Z. 83*: 280-1, 1955
effused on dead leaf midribs on *Rhopalostylis sapida*, Auckland, Waitakeres, Cascades, 900 ft, [3] Apr 1954, S.D. Baker (PDD 13816). Nom. nov. = *Peniophora nikau* G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 145*: 127, 1963. Nikau, Maori name for host plant.

Peniophora thermometra G.H. Cunningham, *Trans. R. Soc. N.Z. 83*: 292, 1955
effused on decayed decorticated logs of *Metrosideros robusta*, Auckland, Hick's Bay, 300 ft, [22] May 1952, G.H. Cunningham (PDD 11483).

Peniophora totara G.H. Cunningham, *Trans. R. Soc. N.Z. 83*: 271, 1955
effused on bark of dead branches and trunks of *Podocarpus hallii*, Auckland, Mt Ruapehu, Silica Springs Track, 2800 ft, [30] Jan 1954, S.D. Baker (PDD 13573). Maori name of host genus.

Peniophora umbracula G.H. Cunningham, *Trans. R. Soc. N.Z. 83*: 291-2, 1955
effused on bark or decorticated dead wood of *Pseudowintera colorata*, Otago, Stewart I., Horse Shoe Bay, [17] Feb 1954, J.M. Dingley (PDD 13660).

Peniophora utriculosa G.H. Cunningham, *Trans. R. Soc. N.Z. 83*: 261-2, 1955
effused on bark or decorticated dead wood of *Leptospermum scoparium*, Auckland, Waitakeres, Anawhata Road, 1000 ft, [28] Sep 1949, J.M. Dingley (PDD 7348).

Peniophora verecunda G.H. Cunningham, *Trans. R. Soc. N.Z. 83*: 262, 1955
effused on decayed decorticated wood *Dacrydium cupressinum*, Auckland, Taupo, Hauhangaroa Range, 2000 ft, [30] Mar 1953, J.M. Dingley (PDD 12513).

Peniophora vesiculosa G.H. Cunningham, *Trans. R. Soc. N.Z. 83*: 259-61, 1955
effused on bark of dead branches and stems of *Pittosporum eugenioides*, Auckland, Kai-

waka, [24] May 1949, J.M. Dingley (PDD 7351).

Perenniporia oviforma G.H. Cunningham ex P.K. Buchanan & L. Ryvarden, *Mycotaxon 31*: 25, 1988

on *Neopanax arboreum*, Auckland, Waitakere Ranges, Swanson, 18 Nov 1945, J.M. Dingley (PDD 4435).

Periconiella araliacearum G.F. Laundon, *N.Z. Jl Bot. 9*: 615, 1971

on living leaves of *Schefflera digitata*, Levin, Waiopehu Reserve, 22 Jun 1969, G.F. Laundon (LEV 3397 [PDD 38660], isotype IMI 141157). Named for host plant family.

Periconiella coprosmae G.F. Laundon, *N.Z. Jl Bot. 9*: 617-8, 1971

on living leaves of *Coprosma australis*, Levin, Waiopehu Reserve, 22 Jun 1969, G.F. Laundon (LEV 3396 [PDD 50657], isotype IMI 141159).

Periconiella cordylinae E.H.C. McKenzie, *Mycotaxon 39*: 232, 1990

on living leaves of *Cordyline banksii*, Coromandel, Kauaeranga Valley, Moss Creek Hut Track, 30 Aug 1986, E.H.C. McKenzie (PDD 48296).

Periconiella liberatas E.H.C. McKenzie, *N.Z. Jl Bot. 20*: 245-6, 1982

on dead leaves of *Chionochloa rigida*, MacKenzie, Glentanner Station, 6 Dec 1978, E.H.C. McKenzie, G.C.M. Latch (PDD 40909).

Periconiella phormii M.B. Ellis, *Mycol. Pap. 111*: 13, 1967

on living leaves of *Phormium tenax*, Levin, Papiatonga Reserve, 31 May 1966, A. Ward ([PDD 50661], holotype IMI 123224).

Perrotia alba R.W.G. Dennis, *Kew Bull. 15*: 301, 1962

on dead branches of *Aristotelia fruticosa*, Taranaki district, Mt Egmont, 900 m, 23 Mar 1951, J.M. Dingley (PDD 18994).

***Pestalosphaeria leucospermi** G.J. Samuels, E. Müller & O. Petrini, *Mycotaxon 28*: 475-8, 1987

on live leaves of *Leucospermum* sp., Taranaki, New Plymouth, Aug 1985, W.F.T. Hartill (PDD 47671). Anamorph = *Pestalotiopsis* sp.

Peziza miltina M.J. Berkeley in J.D. Hooker, *Flora Novae-Zelandiae 2*: 199, 1855

on the bare ground, amongst moss, Hawke's Bay, [Tangoio Village], W. Colenso [b1309] [PDD 40775, holotype K].

Peziza rhytidia M.J. Berkeley in J.D. Hooker, *Flora Novae-Zelandiae 2*: 200, 1855

on ground, Bay of Islands, banks of R. Kawatau, W. Colenso 2554 [PDD 39959, holotype K].

Peziza rifaii J. Moravec & B.M. Spooner, *Tr. Br. mycol. Soc. 90*: 45, 1988

on ground, [Wairarapa, Norsewood], May 1886, W. Colenso b664 [PDD 39367, holotype K]. Named for M.A. Rifai, mycologist.

Peziza spencerii W. Colenso, *Trans. Proc. N.Z. Inst. 22*: 458, 1890

on bare ground in the garden of W.I. Spencer Esq., F.L.S., Napier, Scinde I., Sep 1889, [W. Colenso b889] [PDD 39962, holotype K]. Named for collector, W.I. Spencer.

Pezizella australis R.W.G. Dennis, *Kew Bull. 15*: 312, 1962

on bark of *Quintinia serrata*, Westland, Harihari, 8 Nov 1954, J.M. Dingley (PDD 19037).

Phaeocollybia longipes E. Horak, *Beih. Nova Hedwigia 43*: 188-91, 1973

amongst *Sphagnum* in swamp-forest under *Nothofagus cliffortioides, Phyllocladus alpinus, Libocedrus bidwilli*, etc., Prov. Westcoast, E of Totara Flat, Waiuta, 2 Apr 1968, E. Horak (PDD 27100, isotype ZT 68/246).

Phaeocollybia minuta E. Horak, *Beih. Nova Hedwigia 43*: 187, 1973

on soil amongst mosses in *Nothofagus*-forests (*N. menziesii, N. cliffortioides*) with *Dacrydium cupressinum*, Fjordland [Fiordland], Milford Sound, 1 Apr 1969, E. Horak (PDD 27099, isotype ZT 69/207).

Phaeocollybia ratticauda E. Horak, *Beih. Nova Hedwigia 43*: 184-5, 1973

amongst mosses in *Nothofagus*-forests (*N. menziesii, N. cliffortioides*) intermixed with *Dacrydium cupressinum, Libocedrus bidwillii*, etc., Prov. Westcoast, S of Lake Hochstetter, 29

Mar 1968, E. Horak (PDD 27098, isotype ZT 68/230).

Phaeomarasmius aureosimilis E. Horak, *N.Z. Jl Bot. 18*: 176-7, 1980

on rotten log of *Nothofagus solandri* var. *cliffortioides*, Nelson, Lake Rotoiti, Big Bush, 25 Feb 1969, E. Horak (PDD 27155, isotype ZT 69/113).

Phaeomarasmius hispidulus E. Horak, *N.Z. Jl Bot. 18*: 175, 1980

on rotting leaves and stems of *Olearia* and *Senecio*, Stewart Island, Golden Bay, 12 Mar 1969, E. Horak (PDD 27154, isotype ZT 69/124).

Phaeomarasmius lanatulus E. Horak, *N.Z. Jl Bot. 18*: 178, 1980

on rotten wood and bark of *Nothofagus fusca*, Nelson, Murchison, Matakitaki, 27 Jan 1969, E. Horak (PDD 27157, isotype ZT 69/25).

Phaeomarasmius verrucipes E. Horak, *N.Z. Jl Bot. 18*: 177-8, 1980

on rotting organic debris (*Blechnum, Dicksonia, Neopanax arboreum*), Coromandel Peninsula, Kirikiri Valley, 10 Jul 1968, E. Horak (PDD 27156, isotype ZT 68/658).

Phaeosphaeria kukutae G.S. Ridley, *N.Z. Jl Bot. 26*: 413, 1988

Scirpus nodosus, Wellington south coast, east of Sinclair Head, 22 Sep 1985, G.S. Ridley (PDD 50249). Maori name for host genus.

Phaeosphaeria waikanaensis G.S. Ridley, *N.Z. Jl Bot. 26*: 417, 1988

on decorticated wood, Waikanae, Waikanae River estuary, at high tide mark, [11] Feb 1982, G.S. Ridley (PDD 50261).

Phaeostalagmus novae-zelandiae S.J. Hughes, *N.Z. Jl Bot. 16*: 341, 1978

on dead bark of *Schefflera digitata*, Auckland Prov., Waitakere Range, Piha, Kitekite Track, 11 Jun 1963, S.J. Hughes (PDD 21210, isotype DAOM 93828).

Phallobata alba G.H. Cunningham, *Trans. Proc. N.Z. Inst. 56*: 73, 1926

gregarious on rotting wood in grassy places in the forest, Wellington, Paekakariki, Whakatikei, Forest Reserve, [4 Jun 1923, J.C. Neill, J.G. Myers] (PDD 1187). Nom. nov. = *Hysterangium lobatum* G.H. Cunningham, *Trans. Proc. N.Z. Inst. 67*: 408, 1938.

Phellodon nothofagi R.F.R. McNabb, *N.Z. Jl Bot. 9*: 364, 1971

gregarious or caespitose under *Nothofagus fusca* and *N. menziesii*, Nelson, Maruia, 25 Apr 1969, R.F.R. McNabb, R.J. McNabb (PDD 26563).

Phialocybe improvisa E. Horak, *Aust. J. Bot. Suppl. Ser. 10*: 33, 1983

on decaying wood, E. Horak (PDD 27169, isotype ZT).

Pholiota multicingulata E. Horak, *Aust. J. Bot. Suppl. Ser. 10*: 33, 1983

on rotten wood of Myrtaceae (PDD 27166, isotype ZT).

Phoma lotivora P.R. Johnston, *N.Z. Jl Bot. 19*: 178, 1981

Lotus pedunculatus, [Auckland, Mt Albert Research Centre, May 1980, P.R. Johnston] (PDD 40427, cultotype ICMP 6884).

Phoma nigricans P.R. Johnston, *N.Z. Jl Bot. 19*: 394-5, 1981

on leaf of *Actinidia chinensis*, Auckland, Mt Albert, Apr [Mar] 1979, P.R. Johnston (PDD 39949, cultotype ICMP 6546, CBS 444.81).

Phoma paspali P.R. Johnston, *N.Z. Jl Bot. 19*: 181, 1981

Paspalum dilatatum, [Northland, Kaikohe, Dec 1978, P.R. Johnston] (PDD 39975, cultotype ICMP 6614).

Phoma plurivora P.R. Johnston, *N.Z. Jl Bot. 19*: 181, 1981

Setaria sp., [Auckland, Mt Albert Research Centre, 15 Feb 1979, P.R. Johnston] (PDD 40397, cultotype ICMP 6873).

Phoma pratorum P.R. Johnston, *N.Z. Jl Bot. 19*: 395-6, 1981

on leaf of *Lolium perenne*, Hamilton, Ruakura, Dec 1980, E.H.C. McKenzie (PDD 41671, cultotype ICMP 7049, CBS 445.81).

Phoma rumicicola G.H. Boerema & W.M. Loerakker in Boerema, Loerakker & G.F. Laundon, *N.Z. Jl Bot. 18*: 473, 1980

leaf spots on *Rumex obtusifolius*, Levin, 28 Jun 1979, G.F. Laundon (LEV 15094 [PDD

50667], cultotype CBS 683.79).

Phomatospora leptospermi C.G. Hansford, *Proc. Linn. Soc. N.S.W. 82*: 221, 1957
on leaves of *Leptospermum scoparium*, Auckland, [Piha, 27 Oct 1956], J.M. Dingley (PDD 17247).

Phomopsis cunninghamii H. Sydow, *Ann. Mycol. 22*: 311, 1924
on branches of *Carmichaelia* [*grandifolia*], Wellington, Botanical Gardens, 25 May 1911, A.H. Cockayne (PDD 959). Named for G.H. Cunningham, New Zealand mycologist.

Phragmidium acaenae G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 18 & 51, 1924
on leaves and petioles of *Acaena microphylla*, Southland, Gore, Botanical Gardens, 1 Feb 1921, E.B. Levy (PDD 307).

Phragmidium acuminatum G.H. Cunningham (non *P. acuminatum* (Fr.) Cooke, 1871), *Trans. Proc. N.Z. Inst. 61*: 403-4, 1930
Acaena sanguisorbae var. *sericei-nitens*, Otago, Wakatipu, Table Bay, 800 m, [Jun 1922], W.D. Reid [PDD 770]. Nom. nov. = *Phragmidium constrictum* G.F. Laundon (non *P. constrictum* Bonorden, 1860), *N.Z. Jl Bot. 8*: 311, 1970, *P. constrictosporum* G.F. Laundon, *Trans. Br. mycol. Soc. 67*: 177, 1976.

Phragmidium constrictosporum G.F. Laundon, see *Phragmidium acuminatum*.

Phragmidium constrictum G.F. Laundon, see *Phragmidium acuminatum*.

Phragmidium novae-zelandiae G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 18-9 & 51, 1924
on leaves of *Acaena novae-zelandiae*, Otago, Queenstown, 400 m, 18 Dec 1921, W.D. Reid (PDD 766).

Phragmidium subsimile G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 20-1 & 52, 1924
on leaves of *Acaena sanguisorbae* var. *pilosa*, Otago, Queenstown, 650 m, 18 Dec 1921, W.D. Reid [PDD 768].

Phragmocephala atra (Berk. & Br.) Mason & Hughes var. ***stenophora*** S.J. Hughes, *N.Z. Jl Bot. 16*: 341, 1978
on the bases of dead leaves of *Rhopalostylis sapida*, Auckland Prov., Titirangi, Exhibition Drive, 22 Jan 1963, S.J. Hughes (PDD 30422, isotype DAOM 93749).

Phyllachora cladii-glomerati C.G. Hansford, *Proc. Linn. Soc. N.S.W. 82*: 221-2, 1957
on culms of *Cladium glomeratum*, Auckland, [Silverdale, Oct 1950], J.M. Dingley (PDD 17245).

Phyllachora cunninghamii H. Sydow, *Ann. Mycol. 22*: 301, 1924
on leaves of *Festuca elatior*, Wellington, Palmerston North, 23 Feb 1921, G.H. Cunningham (PDD 1054). Named for G.H. Cunningham, New Zealand mycologist.

Phylloporus novae-zelandiae R.F.R. McNabb, *N.Z. Jl Bot. 9*: 358, 1971
scattered, gregarious, or occasionally caespitose under *Nothofagus menziesii*, Nelson, Karamea, Umere, 8 Jan 1968, R.F.R. McNabb (PDD 26516).

Pistillina stilboidea M.C. Cooke, *Grevillea 19*: 2, 1890
on leaves of *Panax*, [Wairarapa, Norsewood, 'Bartramia Creek', Mar 1886], W. Colenso b423 [syntype PDD 40774, holotype K].

Placosoma nothopanacis H. Sydow, *Ann. Mycol. 22*: 303, 1924
on leaves of *Nothopanax colensoi*, Wellington, Mt Hector, 27 Dec 1919, E.H. Atkinson (PDD 1003, isotype DAOM 142223).

Platygloea australis R.F.R. McNabb, *N.Z. Jl Bot. 7*: 241, 1969
on dead wood of *Pittosporum* sp., Auckland, Henderson Valley, Sharp's Bush, 20 Feb 1966, R.F.R. McNabb (PDD 25293).

Pleuroflammula praestans E. Horak, *Persoonia 9*: 445, 1978
on rotten leaves and branches of *Cordyline indivisa, Neopanax arboreum* and *Pseudopanax crassifolium*, Mt Egmont National Park, Stratford Lodge, 12 Jun 1968, E. Horak (PDD 27133, isotype ZT 68/534).

Pleurotus rattenburyi B.P. Segedin, *Tane 30*: 235-7, 1984 on dead wood of *Nothofagus solandri* var. *cliffortioides*, Tongariro National Park, Whakapapanui Stream, 28 May 1980 [1984], B.P. Segedin (PDD 44961). Named for J. Rattenbury, Botany Department, Auckland University.

Pluteus perroseus E. Horak, *Aust. J. Bot. Suppl. Ser. 10*: 33, 1983
on decaying wood, [E. Horak] (PDD 27165).

Podonectria gahnia J.M. Dingley, *Trans. R. Soc. N.Z. 81*: 498, 1954
parasitic on a Diaspid scale [on *Gahnia setifolia*], Auckland, Waitakere Ranges, Simla [Rd., 19] Oct 1947, [J.M. Dingley] (PDD 10945).

Podonectria novae-zealandiae J.M. Dingley, *Trans. R. Soc. N.Z. 81*: 496, 1954
parasitic on *Leucaspis* sp. [on *Olearia rani*], Auckland, Hunua Range, [Mangatawhiri Stream, 13] Oct 1946, J.M. Dingley (PDD 10942).

Polyporus atrostrigosus M.C. Cooke, *Grevillea 19*: 2, 1890
on stumps, etc., [Hawkes Bay, Dannevirke], W. Colenso b522 [PDD 39361, holotype K].

Polyporus aureofulvus C.G. Lloyd, *Mycol. Notes 66*: 1108, 1922
[on grass under dead log, Wellington, Lake Papaitonga, 14 Sep 1919], G.H. Cunningham [PDD 175].

Polyporus colensoi M.J. Berkeley in J.D. Hooker, *Flora Novae-Zelandiae 2*: 178, 1855
on trunks of trees in forests, Tehawera, W. Colenso [2088] [PDD 40773, holotype K]. Refers to collector, W. Colenso.

Polyporus exiguus [exiguis] W. Colenso, *Trans. Proc. N.Z. Inst. 17*: 266, 1884 (1885)
among moss, on the bark of old trees near their bases, wet woods, Waipawa County, near Norsewood, 1883, W. Colenso b13 [PDD 39850, holotype K].

Polyporus nivicolor W. Colenso, *Trans. Proc. N.Z. Inst. 16*: 361-2, 1883 (1884)
on decaying logs, in dense forest, Waipawa County, between Norsewood and Dannevirke, [Monoclea Creek], 1883, W. Colenso b272 [PDD 39329, holotype K].

Polyporus rosularis G.H. Cunningham, *Bull. Plant Dis. Div. N.Z. Dep. scient. ind. Res. 74*: 6 & 36, 1948
on rotting logs or stumps of *Nothofagus* [*fusca*], Hawkes Bay, Lake Waikaremoana, Waikareiti Track, Jan 1933, J.G. Gibbs [PDD 3914].

Polyporus rosulatus G.H. Cunningham, *Bull. Plant Dis. Div. N.Z. Dep. scient. ind. Res. 74*: 5 & 36, 1948
on burnt wood, soil in the forest, or on rotting logs and bases of stumps [of *Pinus radiata*], Auckland, Kaingaroa, 1500 ft, May 1946, G.B. Rawlings [PDD 5691].

Polyporus setiger M.C. Cooke, *Grevillea 19*: 1, 1890
on rotten logs, [Hawkes Bay, Dannevirke], W. Colenso b517 [PDD 39360, holotype K].

Poria aroha G.H. Cunningham, *Bull. Plant Dis. Div. N.Z. Dep. scient. ind. Res. 72*: 25-6 & 39, 1947
on bark of dead fallen trunk of *Beilschmiedia tawa*, Auckland, Mt Te Aroha, 1500 ft, Nov 1946, G.H. Cunningham [PDD 5253].

Poria coprosmae G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 72*: 18 & 38-9, 1947
on bark of dead standing branch of *Coprosma* sp., Westland, Lake Mapouriki, 350 ft, [28] Nov 1946, J.M. Dingley [PDD 5252].

Poria cordylina G.H. Cunningham, *Bull. Plant Dis. Div. N.Z. Dep. scient. ind. Res. 72*: 23 & 39, 1947
on bark and stem of standing rotting trunk of *Cordyline australis*, Auckland, Hamilton, Claudelands Reserve, 200 ft, [11] Nov 1946, G.H. Cunningham [PDD 5248].

Poria hunua G.H. Cunningham, *Bull. Plant. Dis. Div. N.Z. Dep. scient. ind. Res. 72*: 19 & 39, 1947
on fallen fire-charred trunk of *Beilschmiedia tawa*, Auckland, Hunua Range, Upper Wairoa Valley, [7] Sep 1946, J.M. Dingley [PDD 5279].

Poria manuka G.H. Cunningham, *Bull. Plant Dis. Div. N.Z. Dep. scient. ind. Res. 72*: 8 & 38, 1947 on bark and wood of standing fire-killed stems and branches of *Leptospermum scoparium*, Auckland, North slope of Mt Tongariro, 2500 ft, Jan 1940, G.H. Cunningham [PDD 4122]. Maori name for host plant.

Poria nothofagi G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 164*: 47 & 261, 1965
on dead bark of *Nothofagus cliffortioides*, Wellington, Waihohonu River, Mt Tongariro, 1200 m, [Jan 1947, J.D. Atkinson] (PDD 5275).

Poria novaezelandiae G.H. Cunningham, *Bull. Plant Dis. Div. N.Z. 72*: 29 & 40, 1947
on decorticated rotting log of *Metrosideros* sp. lying on the floor of tawa forest, Auckland, Mt Te Aroha, 2000 ft, Nov 1946, G.H. Cunningham [PDD 5322].

Poria otakou G.H. Cunningham, *Bull. Plant Dis. Div. N.Z. Dep. scient. ind. Res. 72*: 17 & 38, 1947
on bark of fallen branch of *Nothofagus fusca*, Otago, Kinloch, head of Lake Wakatipu, 1250 ft, Jan 1942, G.H. Cunningham [PDD 4182].

Poria pirongia G.H. Cunningham, *Bull. Plant Dis. Div. N.Z. Dep. scient. ind. Res. 72*: 24 & 39, 1947
on dead branches of *Hedycarya arborea*, Auckland, Mt Pirongia, 2000 ft, [28] Dec 1945, J.M. Dingley [PDD 4406].

Poria rata G.H. Cunningham, *Bull. Plant Dis. Div. N.Z. Dep. scient. ind. Res. 72*: 33 & 40, 1947
on decorticated fallen trunk of *Metrosideros robusta* lying on the forest floor, Wellington, Ruahine Ranges, Ngatamoti, 2800 ft, [27] Jan 1933, J.G. Gibbs [PDD 3868]. Maori name for host plant.

Poria totara G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 164*: 59 & 261, 1965
on decayed bark and decorticated wood of *Podocarpus totara*, Auckland, Whitianga-Coromandel Road, 100 m, [Nov 1947, G. Chamberlain] (PDD 6657).

Poria weraroensis G.H. Cunningham, *Bull. Plant Dis. Div. N.Z. Dep. scient. ind. Res. 72*: 36-7 & 40, 1947
on bark of dead standing stem of *Coprosma grandifolia*, Wellington, Weraroa, 160 ft, [12] Aug 1919, G.H. Cunningham [PDD 1838].

Porphyrellus brunneus R.F.R. McNabb, *N.Z. Jl Bot. 5*: 539-41, 1967
solitary or occasionally gregarious under *Leptospermum ericoides*, Auckland, Titirangi, [Atkinson Park], 11 May 1965, R.F.R. McNabb (PDD 24696).

Porphyrellus nothofagi R.F.R. McNabb, *N.Z. Jl Bot. 5*: 543, 1967
solitary, gregarious or caespitose under *Nothofagus menziesii*, Otago, Catlins, Puketiro Reserve, 29 Mar 1966, R.F.R. McNabb (PDD 25184).

Porphyrellus novae-zelandiae R.F.R. McNabb, *N.Z. Jl Bot. 5*: 536-7, 1967
solitary or occasionally gregarious under *Leptospermum ericoides* and *Cyathea dealbata*, Auckland, Titirangi, [Atkinson Park], 20 Jun 1965, A.Y. McNabb (PDD 24627).

Porphyrellus viscidus R.F.R. McNabb, *N.Z. Jl Bot. 5*: 543-4, 1967
solitary or scattered under *Leptospermum ericoides* and *L. scoparium*, Kerikeri, Opito Bay, 16 May 1966, R.F.R. McNabb (PDD 25185).

Porphyrellus viscidus McNabb var. **macrosporus** R.F.R. McNabb, *N.Z. Jl Bot. 5*: 546, 1967
solitary under *Leptospermum ericoides*, Auckland, Waitakere Filter Station, 25 May 1966, R.F.R. McNabb (PDD 25186).

Pouzaromyces minutus E. Horak, *Beih. Nova Hedwigia 43*: 82-3, 1973
on soil in forests (*Podocarpus dacrydioides, Elaeocarpus hookerianus, Melicytus ramiflorus,* etc.), Murchison, W of Matakitaki-River, 25 Jan 1969, E. Horak (PDD 27059, isotype ZT 69/14).

Proliferodiscus dingleyi [dingleyae] B.M. Spooner, *Biblthca mycol. 116*: 635-7, 1987
on bark of *Nothofagus menziesii*, Hawkes Bay, Poronui, Upper Homestead, 2000 ft, 2 Jun 1953, J.M. Dingley (PDD 18988, holotype K).

Propolis dendrobii P.R. Johnston, *N.Z. Jl Bot. 24*: 115, 1986
on fallen leaves of *Dendrobium cunninghamii*, Stewart I. The Neck, Track between Glory Cove and Chew Tobacco Bay, 5 May 1984, P.R. Johnston, H. Donner (PDD 45272).

Propolis dracophylli P.R. Johnston, *N.Z. Jl Bot. 24*: 115-118, 1986
on fallen leaves of *Dracophyllum longifolium*, Stewart I. The Neck, Glory Cove, 5 May 1984, P.R. Johnston, H. Donner (PDD 46721).

Pseudocercospora dodonaeae H.J. Boesewinkel, *Trans. Br. mycol. Soc. 77*: 454, 1981
on living leaves of *Dodonaea viscosa*, Auckland, Jul 1978 [May 1980], H.J. Boeswinkel (PDD 41332).

Pseudohelotium juncicola W.R.G. Dennis, *Kew Bull. 15*: 315, 1962
on old leaves of *Juncus vaginatus*, Wellington, Upper Hutt, Hutt River, 31 Jul 1952, A.J. Healey (PDD 19045).

Pseudospiropes novae-zealandiae S.J. Hughes, *N.Z. Jl Bot. 27*: 452-4, 1989
on decaying bark of *Nothofagus fusca*, Wellington Prov., Tongariro National Park, Ohakune Mt Road, 750 m, 7 Mar 1963, S.J. Hughes (PDD 36106, holotype DAOM 178616a).

Pseudostypella nothofagi R.F.R. McNabb, *N.Z. Jl Bot. 7*: 259, 1969
on dead wood of *Nothofagus solandri*, Canterbury Province, Garry River, 13 Apr 1958, J.M. Dingley (PDD 25008).

Psilocybe aucklandii G. Guzmán, C. King & V.M. Bandala, *Mycol. Res. 95*: 507-8, 1991
on ground under *Pinus radiata*, Auckland, Wood Hill State Park [Woodhill State Forest], Jun 1989, C.C. King (PDD [57236], isotype XAL).

Psilocybe novae-zelandiae G. Guzmán & E. Horak, *Sydowia 31*: 51-3, 1978 (1979)
single or caespitose in small groups on soil under *Nothofagus cliffortioides* var. *solandri* and *N. fusca*, Canterbury, Mt Grey, Kowai Bush, 15 Sep 1967, E. Horak (PDD 27132, isotype ZT 67/104, ENCB).

Puccinia alboclava G.T.S. Baylis, *Trans. R. Soc. N.Z. 82*: 633, 1954
on leaves of seedlings of *Clematis indivisa*, Otago, Mt Haungatua [Maungatua Range, Traquair], 1300 ft, 9 Jul 1950, G.T.S. Baylis (PDD 12685 [12683]).

Puccinia allanii G.H. Cunningham, *Trans. Proc. N.Z. Inst. 54*: 675, 1923
on leaves of *Senecio lagopus*, Canterbury, Banks Peninsula, Mt Herbert, 5 Feb 1921, H.H. Allan (PDD 425). Named for collector, H.H. Allan.

Puccinia anisotominis G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 4 & 12, 1924
on leaves of *Anisotome haastii*, Otago, Lake Harris Track, 1000 m, 6 May 1921, W.D. Reid (PDD 743 [9116]).

Puccinia aorangi G.H. Cunningham, *Trans. Proc. N.Z. Inst. 61*: 411-2, 1930
Celmisia major, Taranaki, Mt Egmont, 1600-2000 m, [Feb 1929], H.H. Allan, G.H. Cunningham [PDD 3463].

Puccinia arnaudensis G.H. Cunningham, *Trans. Proc. N.Z. Inst. 59*: 491-2, 1929 (1928)
Rostkovia gracilis, Nelson, Mt St. Arnaud, 1800 m, Feb 1928, H.H. Allan [PDD 3396].

Puccinia atkinsonii G.H. Cunningham, *Trans. Proc. N.Z. Inst. 54*: 675-6 & 692, 1923
on leaves of *Olearia excorticata*, Wellington, Mt Hector, Table-top, 1170 m, 6 Feb 1921, E.H. Atkinson (PDD 308 [1414]). Named for collector, E.H. Atkinson.

Puccinia celmisiae G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 8-9 & 13, 1924
on leaves of *Celmisia coriacea*, Canterbury, Hanmer, Mt Isobel, 1170 m, 4 Nov 1921, W.D. Reid [PDD 9185]. Anamorph = *Uredo celmisiae* M.C. Cooke.

Puccinia cockaynei G.H. Cunningham, *Trans. Proc. N.Z. Inst. 54*: 670 & 692, 1923
Gentiana corymbifera, Otago, Queenstown, 22 Jan 1920, E.H. Atkinson [PDD 1362]. Named for A.H. Cockayne, a Government biologist.

Puccinia contegens G.H. Cunningham, *Trans. Proc. N.Z. Inst. 54*: 656-7 & 692-3, 1923
on leaves of *Ranunculus multiscapus*, Otago, Macraes, 28 Nov 1921, W.D. Reid (PDD 284).

Puccinia coprosmae M.C. Cooke, *Grevillea 19*: 2-3, 1890
Coprosma lucida, Stewart I., [Half Moon Bay, coast, 1882], T. Kirk [PDD 7596, holotype K].

Puccinia crinitae R.F.R. McNabb, *Trans. R. Soc. N.Z. Bot. 1*: 241, 1962
on *Dichelachne crinita*, Wellington, Mt Victoria, [7] Feb 1961, R.F.R. McNabb (PDD 19636). Anamorph = *Uredo crinitae* McNabb.

Puccinia cuniculi G.H. Cunningham, *Trans. Proc. N.Z. Inst. 54*: 666 & 693, 1923
on leaves, stems, and petioles of *Angelica gingidium*, Canterbury, Arthur's Pass, Punch-bowl Falls, 31 Jan 1920, E.H. Atkinson (PDD 289).

Puccinia egmontensis G.H. Cunningham, *Trans. Proc. N.Z. Inst. 54*: 681-2 & 693-4, 1923
on leaves of *Celmisia glandulosa*, Taranaki, Mt Egmont, 1170 m, 3 Jan 1922, W.D. Reid, N.R. Foy (PDD 491).

Puccinia euphrasiana G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 6 & 12, 1924
on leaves of *Euphrasia cuneata*, Wellington, York Bay, [7 Sep 1922], E.H. Atkinson, [G.H. Cunningham] (PDD 727).

Puccinia fodiens G.H. Cunningham, *Trans. Proc. N.Z. Inst. 54*: 682-3 & 694, 1923
on leaves of *Celmisia rigida*, Otago, Queenstown, Botanical Gardens, 3 Dec 1919, G.H. Cunningham (PDD 376).

Puccinia foyana G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 3 & 10-1, 1924
on leaves, stems, and petioles of *Ranunculus enysii*, Canterbury, Cass, 650 m, 20 Jan 1922, N.R. Foy (PDD 581 [767]). Named for collector, N.R. Foy.

Puccinia freycinetiae E.H.C. McKenzie, *N.Z. Jl Bot. 26*: 99, 1988
Freycinetia baueriana ssp. *banksii*, Taranaki, Oakura, Mar 1983, P.J. Garnock-Jones (PDD 43835).

Puccinia gahniae J.M. Dingley, *N.Z. Jl Bot. 15*: 31, 1977
Gahnia sp., Wellington, Taita, 10 Mar 1953, A.J. Healy (PDD 12113).

Puccinia gei-parviflori R.F.R. McNabb, *N.Z. Jl Bot. 4*: 87, 1966
Geum parviflorum, Canterbury, Godley River Valley, Jan 1959, D. Scott (PDD 21664).

Puccinia grahami G.H. Cunningham, *Trans. Proc. N.Z. Inst. 59*: 492, 1929 (1928)
Aciphylla monroi, Canterbury, Mt Cook, Sealey Lake, 1500 m, Jan 1928, H.H. Allan [PDD 3399]. Named for Peter Graham, a guide at Mt Cook.

Puccinia halorrhagidis G.H. Cunningham (non *P. halorrhagidis* Sydow, 1913), *Trans. Proc. N.Z. Inst. 54*: 664-5 & 694, 1923
Halorrhagis erecta, Wellington, Seatoun, seashore, 10 Feb 1921, E.H. Atkinson, G.H. Cunningham (PDD 414). Nom. nov. = *Puccinia toa* G.H. Cunningham, *Trans. Proc. N.Z. Inst. 61*: 408, 1930. Maori name (toatoa) of host plant.

Puccinia hectorensis G.H. Cunningham, *Trans. Proc. N.Z. Inst. 54*: 683 & 694-5, 1923
on leaves and petioles of *Senecio bidwillii*, Wellington, Tararua Mountains, Mt Dennan, 1200 m, 7 Jan 1922, E.H. Atkinson (PDD 495). Named for James Hector, a Geologist.

Puccinia heketara G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 393 & 396, 1924
on leaves, petioles, and stems of *Olearia cunninghamii*, Wellington, York Bay, 100 m, [2 Oct 1923], E.H. Atkinson (PDD 1244 [1415]). Maori name for host plant.

Puccinia hoheriae G.H. Cunningham (syn. *P. hoheriae* Wakefield, 1917), *Trans. Proc. N.Z. Inst. 54*: 661 & 695, 1923
on leaves, petioles, and shoots of *Hoheria populnea*, Wellington, Karori, 8 Dec 1920, R. Waters [PDD 1445].

Puccinia inornata G.H. Cunningham, *Trans. Proc. N.Z. Inst. 54*: 657 & 695, 1923
on leaves, petioles, and stems of *Cardamine heterophylla*, Otago, Macraes, 600 m, 29 Nov 1921, W.D. Reid (PDD 444).

Puccinia keae G.H. Cunningham, *Trans. Proc. N.Z. Inst. 59*: 493-4, 1929 (1928)
Olearia nummularifolia, Canterbury, Mt Cook, Kea Point, 700 m, Jan 1928, H.H. Allan, G.H. Cunningham [PDD 3380].

Puccinia kinseyi G.H. Cunningham, *Trans. Proc. N.Z. Inst. 59*: 493, 1929 (1928)
Angelica geniculata, Canterbury, Raikaia Gorge island, 400 m, Jan 1928, H.H. Allan [PDD 3373]. Named for Sir Joseph Kinsey.

Puccinia kirkii G.H. Cunningham, *Trans. Proc. N.Z. Inst. 54*: 653 & 695-6, 1923
on leaves of *Rumex flexuosus*, Otago, Clinton Valley, 12 [18] Jan 1920, E.H. Atkinson (PDD 274 [3665]. Named for T. Kirk.

Puccinia koherika G.H. Cunningham, *Trans. Proc. N.Z. Inst. 61*: 408-9, 1930
Angelica rosaefolia, Auckland, Tolago [Tolaga] Bay, 20 m, [Nov 1928], H.H. Allan, J.G. Gibbs [PDD 3419]. Maori name for host plant.

Puccinia kopoti G.H. Cunningham, *Trans. Proc. N.Z. Inst. 54*: 668-9 & 696, 1923
on leaves and petioles of *Anisotome aromatica*, Otago, Lake Harris, 1100 m, 6 May 1921, W.D. Reid (PDD 377). Maori name for host plant.

Puccinia mania G.H. Cunningham, *Trans. Proc. N.Z. Inst. 61*: 404, 1930
Carex wakatipu, Westland, Mt Mantell, 1700 m, [Feb 1928], G.H. Cunningham [PDD 3215]. Maori name for host plant.

Puccinia maurea G.H. Cunningham, *Trans. Proc. N.Z. Inst. 61*: 406, 1930
Carex inversa, Auckland, Mt St. John, 300 m, D. Petrie [PDD 9385]. Maori name for host plant.

Puccinia moschata G.H. Cunningham, *Trans. Proc. N.Z. Inst. 61*: 410-1, 1930
Olearia moschata, Canterbury, Mt Cook, Black Birch Creek, 1200 m, [Jan 1928], G.H. Cunningham [PDD 3377]. Anamorph = *Uredo moschatus* G.H. Cunningham.

Puccinia namua G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 3 & 11, 1924
on leaves and stems of *Anisotome filifolia*, Canterbury, Hanmer, Mt Isobel, 1000 m, 4 Nov 1921, W.D. Reid (PDD 741 [1386]). Maori name for host plant.

Puccinia novae-zelandiae G.H. Cunningham, *Trans. Proc. N.Z. Inst. 54*: 686 & 696-7, 1923
on leaves of *Olearia forsteri*, Wellington, Pencarrow, coast, 10 Feb 1921, E.H. Atkinson (PDD 310).

Puccinia oreomyrrhidis G.H. Cunningham, *Trans. Proc. N.Z. Inst. 54*: 669 & 697, 1923
on leaves of *Oreomyrrhis andicola*, Canterbury, Hanmer, Glyn [Glen] Wye, 25 Oct 1919, W.D. Reid (PDD 278).

Puccinia pedatissima G.H. Cunningham, *Trans. Proc. N.Z. Inst. 54*: 673 & 697, 1923
on leaves, veins, and petioles of *Ourisia macrophylla*, Taranaki, Mt Egmont, 1200 m, 2 Jan 1922, W.D. Reid, N.R. Foy (PDD 494).

Puccinia perlaevis G.H. Cunningham, *Trans. Proc. N.Z. Inst. 59*: 494, 1928
Olearia lacunosa, Nelson, Mt Arthur, 1300 m, Feb 1928, G.H. Cunningham [PDD 3382].

Puccinia polypogonobia E.H.C. McKenzie, *N.Z. Jl Bot. 18*: 336, 1980
Polypogon monspeliensis, Northland, Kaitaia, 30 Nov 1976, E.H.C. McKenzie (PDD 35748).

Puccinia pounamu G.H. Cunningham, *Trans. Proc. N.Z. Inst. 54*: 688 & 697, 1923
on leaves of *Senecio southlandicus*, Otago, Greenstone Valley, 500 m, 5 Apr 1921, W.D. Reid (PDD 426). Maori name of the locality.

Puccinia pseudomenthae G.H. Cunningham, *Trans. Proc. N.Z. Inst. 61*: 409, 1930
Mentha cunninghamii, Westland, Franz Josef [Fox] Glacier, 250 m, [Jan 1928], H.H. Allan, G.H. Cunningham [PDD 3156].

Puccinia rara E.H.C. McKenzie, *N.Z. Jl Bot. 18*: 335, 1980
Dichelachne rara, Auckland, Waikumete, 9 Nov 1976, E.H.C. McKenzie, W.S.M. Versluys, S. Bowman (PDD 35538).

Puccinia rautahi G.H. Cunningham, *Trans. Proc. N.Z. Inst. 61*: 405-6, 1930
Carex gaudichaudiana, Otago, Mt Judah, 900 m, [14 Dec 1921], W.D. Reid [PDD 492]. Maori name for host plant.

Puccinia reidii G.H. Cunningham, *Trans. Proc. N.Z. Inst. 54*: 657 & 698, 1923
on leaves, petioles, and stems of *Radicula* sp. [*Cheesemania wallii*], Otago, Walter Peak, 27 Apr 1921, W.D. Reid (PDD 378). Named for collector, W.D. Reid.

Puccinia schoenus G.H. Cunningham, *Trans. Proc. N.Z. Inst. 61*: 407, 1930
Schoenus pauciflorus, Canterbury, Cook Range, 700 m, [Jan 1928], G.H. Cunningham [PDD 3393]. Anamorph = *Uredo schoenus* G.H. Cunningham.

Puccinia tararua G.H. Cunningham, *Trans. Proc. N.Z. Inst. 54*: 671 & 698, 1923
on leaves and stems of *Gentiana patula*, Wellington, Mt Hector, Table-top, 1170 m, 6 Feb 1921, E.H. Atkinson (PDD 379). Locality, Tararua Ranges.

Puccinia tekapo R.F.R. McNabb, *Trans. R. Soc. N.Z. Bot. 1*: 110-2, 1962
Olearia odorata, Canterbury, Lake Tekapo, [on slopes of Mt Mistake], Middle Gorge Creek, [26] Apr 1959 [1958], D. Scott (PDD 19170).

Puccinia tetragoniae McAlpine var. ***novae-zelandiae*** E.H.C. McKenzie, *Mycotaxon 41*: 307, 1991
Tetragonia tetragonioides, Chatham I., Rekohu, Waitangi, 13 Mar 1983, E.H.C. McKenzie (PDD 56064).

Puccinia tiritea G.H. Cunningham, *Trans. Proc. N.Z. Inst. 54*: 654 & 698, 1923
on leaves of *Muehlenbeckia australis*, Wellington, Palmerston North, Tiritea, 300 m, 3 Mar 1921, G.H. Cunningham (PDD 382).

Puccinia toa G.H. Cunningham, see *Puccinia halorrhagidis*.

Puccinia wahlenbergiae G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 8 & 13, 1924
on leaves, stems, and inflorescences of *Wahlenbergia albomarginata*, Taupo, Tokaanu-Waiouru Road, 830 m, 12 Mar 1922, E.H. Atkinson (PDD 592).

Puccinia whakatipu G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 4 & 11-12, 1924
on leaves and stems of *Anisotome filifolia*, Otago, Wakatipu, Table Bay, 830 m, 23 May 1922, W.D. Reid (PDD 742).

Pyrrhoglossum viriditinctum E. Horak, *Opera Bot. 100*: 118, 1989
on rotten wood of *Dacrydium cupressinum*, Prov. Gisborne, Urewera N.P., Ngamoko Track, 21 May 1981, E. Horak (PDD 27220, isotype ZT 629).

Pythium erinaceum G.I. Robertson, *N.Z. Jl Bot. 17*: 283, 1979
soil, Canterbury, Apr 1975 [20 Aug 1978], G.I. Robertson (PDD 38535, cultotype ICMP 6195).

Ramaria ambigua R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 95 & 157, 1988
under *Dacrydium* and tree ferns, Upper Hutt, Kaitoke Waterworks, 27 [22] May 1982, R.H. Petersen ([PDD 46687], isotype TENN).

Ramaria anziana R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 104 & 158, 1988
[on bank under *Nothofagus* sp.], Nelson, Graham River Valley, Haycock's Bush, 15 May 1982, G.J. Samuels, P.R. Johnston ([PDD 46686], isotype TENN).

Ramaria aureorhiza R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 111 & 159, 1988
on rotten wood of *Nothofagus*, Nelson, Graham River Valley, Haycock's Bush, 15 May 1982, [G.J. Samuels] ([PDD 46682], isotype TENN).

Ramaria avellaneo-vertex R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 105 & 158, 1988
under *Agathis*, Waipoua Kauri Reserve, vic. Forestry Headquarters, 11 May 1983, R.H. Petersen ([PDD 46684], isotype TENN).

Ramaria basirobusta R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 105 & 158, 1988
under *Nothofagus* [*solandri*], Canterbury, Craigieburn Forest Reserve, 3 Jun 1981, R.H. Petersen ([PDD 46629], isotype TENN).

Ramaria gigantea (Pat.) Petersen f. ***tenuispora*** R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 97 & 157, 1988
FGNP, Gillespie's Beach, 8 May 1982, R.H. Petersen ([PDD 46678], isotype TENN).

Ramaria junquilleo-vertex R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 106 & 158, 1988
under *Leptospermum* and *Nothofagus* [*truncata*], Little Barrier I., Waipawa Stream, 16 Jun 1981, E. Horak ([PDD 46679], holotype ZT, isotype TENN).

Ramaria ochracea (Bres.) Corner var. ***sicco-olivacea*** R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 98 & 158, 1988
on well rotted wood and woody debris, Waipoua Kauri Reserve, vic. Forestry Headquarters,

30 May 1982, G.J. Samuels ([PDD 46680], isotype TENN).

Ramaria pancaribbea Petersen var. ***zealandica*** R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 99 & 158, 1988

under podocarps, FG National Park, road to Gillespie's Beach, 9 May 1982, R.H. Petersen [G.J. Samuels] ([PDD 46655], isotype TENN).

Ramaria perfluo-punicea R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 100 & 158, 1988

on humus and woody debris, Omahuta State Forest, kauri forest, 1 Jun 1982, R.H. Petersen ([PDD 46630], isotype TENN).

Ramaria purpureopallida R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 115 & 160, 1988

under *Nothofagus solandri* var. *cliffortioides* and *N. fusca*, Canterbury, A.H. [Mt] Grey, Kowai Bush, 16 Feb 1968, E. Horak ([PDD 46683], holotype ZT, isotype TENN).

Ramaria rotundispora R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 109 & 159, 1988

under pure stand of *Leptospermum*, Little Barrier I., Tirikawa Stream, 14 Jun 1981, E. Horak ([PDD 46653], holotype ZT, isotype TENN).

Ramaria samuelsii R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 110 & 159, 1988

[under *Nothofagus* sp.], Upper Hutt, Kaitoke Waterworks, 22 May 1982, R.H. Petersen ([PDD 46681], isotype TENN). Named for mycologist, G.J. Samuels.

Ramaria sclero-carnosa R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 114 & 159, 1988

on rotten wood or woody debris, especially *Agathis*, Waipoua Kauri Reserve, Yakas Tree Track, 24 Jun 1981, R.H. Petersen ([PDD 46685], isotype TENN).

Ramariopsis agglutinata R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 122 & 160, 1988

on soil with algae and/or moss protonemata, Urewera National Park, Waikare-iti Track, 24 May 1981, R.H. Petersen [E. Horak] ([PDD 46651], isotype TENN).

Ramariopsis alutacea R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 122 & 160, 1988

on woody debris, Waipoua Kauri Reserve, vic. Forestry Headquarters, 21 Jun 1981, R.H. Petersen ([PDD 46667], isotype TENN).

Ramariopsis aurantio-olivacea R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 123 & 160, 1988

Omahuta State Forest, Kauri Reserve, 1 Jun 1982, R.H. Petersen ([PDD 46654], isotype TENN).

Ramariopsis avellanea R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 133 & 162, 1988

Waipoua Kauri Reserve, Yakas Tree Track, 24 Jun 1981, R.H. Petersen ([PDD 46627], isotype TENN).

Ramariopsis avellaneo-inversa R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 135 & 163, 1988

on tree fern debris on clay bank, Pelorus Scenic Reserve, 19 May 1982, R.H. Petersen ([PDD 46632], isotype TENN).

Ramariopsis bicolor R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 124 & 161, 1988

[on live tree fern base], Nelson, Abel Tasman National Park, coast track, 16 May 1982, R.H. Petersen ([PDD 46668], isotype TENN).

Ramariopsis cremicolor R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 125 & 161, 1988

Urewera National Park, 26 May 1982, R.H. Petersen ([PDD 46666], isotype TENN).

Ramariopsis depokensis (van Over.) Petersen f. ***persicina*** R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 127 & 161, 1988

Waipoua Kauri Reserve, Te Matua Ngahere Track, 31 May 1982, R.H. Petersen ([PDD 46637], isotype TENN).

Ramariopsis junquillea R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 127 & 161, 1988

Urewera National Park, 26 May 1982, R.H. Petersen ([PDD 46626], isotype TENN).

Ramariopsis longipes R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 136 & 163, 1988

[under *Nothofagus, Dacrydium* & fern], Pelorus Bridge Scenic Reserve, 19 [16] May 1982, R.H. Petersen ([PDD 46665], isotype TENN).

Ramariopsis ramarioides R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 138 & 163, 1988

Waipoua Kauri Reserve, vic. Forestry Headquarters, [21 Jun 1981], R.H. Petersen ([PDD 46638], isotype TENN).

Ramariopsis tortuosa R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 131 & 162, 1988

under *Pinus rigida* on soil, Waipoua Kauri Reserve, vic. Forestry Headquarters, 21 Jun 1981, R.H. Petersen ([PDD 46664], isotype TENN).

Rhinocladium dingleyae S.J. Hughes, *N.Z. Jl Bot. 18*: 171, 1980

on rotten wood of *Tetrapathaea tetrandra*, Auckland Province, Cornwallis, 3 Jan 1963, J.M. Dingley (PDD 36100, isotype DAOM 96163).

Rhizophagus tenuis J.M. Greenall, *N.Z. Jl Bot. 1*: 398, 1963

on roots of *Griselinia littoralis*, Dunedin, [5 Jul 1963, G.T.S. Baylis] (PDD 21626).

Rhodocybe conchata E. Horak, *N.Z. Jl Bot. 17*: 275, 1979

on rotten trunk of *Cyathea dealbata* or *Nothofagus* sp., Coromandel Peninsula, Kauaeranga Valley, 8 Jul 1968, E. Horak (PDD 27143, isotype ZT 68/648).

Rhodocybe dingleyi [dingleyae] E. Horak, *N.Z. Jl Bot. 17*: 280, 1979

on soil in forests (under *Nothofagus* spp., *Leptospermum* spp., *Phyllocladus* sp., etc.), Hunua Range, Mangatangi Gorge, 26 Apr 1972, J.M. Dingley (PDD 30259, isotype ZT 72/582). Named for J.M. Dingley, New Zealand mycologist.

Rhodocybe fuliginea E. Horak, *N.Z. Jl Bot. 17*: 280-1, 1979

on rotten trunk of *Cyathea medullaris*, Nelson, N of Pakawau, 15 May 1968, E. Horak (PDD 27142, isotype ZT 68/451).

Rhodocybe iti E. Horak, *N.Z. Jl Bot. 17*: 277-8, 1979

on soil among rotting leaves and debris in forests (under *Nothofagus fusca, Schefflera* sp., *Fuchsia* sp., *Aristotelia* sp., *Weinmannia* sp., *Dacrydium cupressinum*), West Coast, Hari Hari, W. slope of Mt Wilberg, 15 Feb 1969, E. Horak (PDD 27145, isotype ZT 69/80). Iti, small, from Maori.

Rhodocybe maleolens E. Horak, *N.Z. Jl Bot. 17*: 278-9, 1979

on soil and on rotting plant debris in forests (under *Nothofagus fusca, Dacrydium cupressinum, Dracophyllum* spp.), Nelson, N of Collingwood, Pakawau Creek, 7 May 1968, E. Horak (PDD 27144, isotype ZT 68/384).

Richoniella pumila G.H. Cunningham, *N.Z. Jl Sci. Technol. 22*: 62b, 1940

[in ground], Auckland, Waitakere Ranges, Titirangi, M. Hodgkins [PDD 8385].

Rosellinia radiciperda G. Massee, *Bull. misc. Inf. R. bot. Gdns Kew 1896*: 3, 1896

at the base of a fallen and decayed apple tree, W. Colenso [PDD 16424, holotype K].

Rosenscheldiella brachyglottidis G.F. Laundon & A. Sivanesan in Laundon, *N.Z. Jl Bot. 9*: 619-20, 1971

leaf spot on living leaves of *Brachyglottis repanda* var. *rangiora*, Levin, Waiopehu Reserve, 27 Dec 1968, G.F. Laundon (LEV 3021 [PDD 29848], isotype IMI 139084).

Rozites castanella E. Horak & M. Taylor, *N.Z. Jl. Bot. 19*: 358-9, 1981

on soil among litter and moss under *Nothofagus menziesii, N. solandri*, and *N. fusca*, East Coast, Urewera N.P., Ngamoko, 27 Jun 1968, E. Horak (PDD 27161, isotype ZT 68/617).

Rozites fusipes E. Horak & M. Taylor, *N.Z. Jl. Bot. 19*: 356-7, 1981
on soil among litter under *Nothofagus solandri* var. *cliffortioides* and *N. menziesii*, Nelson, Lake Rotoiti, track to Mt Robert, 2 May 1968, E. Horak (PDD 27162, isotype ZT 68/344).

Rozites meleagris E. Horak & M. Taylor, *N.Z. Jl. Bot. 19*: 354-6, 1981
on soil among litter and moss (including *Sphagnum*) in *Nothofagus* forests (*N. fusca, N. menziesii* and *N. solandri*), Canterbury, Lewis Pass, 23 Mar 1968, E. Horak (PDD 27164, isotype ZT 68/215).

Rozites pallida E. Horak & M. Taylor, *N.Z. Jl. Bot. 19*: 356, 1981
on soil among litter and moss under *Nothofagus menziesii* and *N. fusca*, Nelson, Lake Rotoiti, track to St. Arnaud Range, 23 May 1968, E. Horak (PDD 27163, isotype ZT 68/507).

Russula acrolamellata R.F.R. McNabb, *N.Z. Jl Bot. 11*: 689-91, 1973
solitary or occasionally in pairs under *Leptospermum ericoides*, Auckland, Titirangi, Atkinson Park, 13 Feb 1967, R.F.R. McNabb (PDD 26627).

Russula albolutescens R.F.R. McNabb, *N.Z. Jl Bot. 11*: 677-8, 1973
solitary or in pairs under *Leptospermum ericoides*, Auckland, Titirangi, Atkinson Park, 13 Mar 1967, R.F.R. McNabb (PDD 26584).

Russula allochrous R.F.R. McNabb, *N.Z. Jl Bot. 11*: 680-1, 1973
gregarious under *Leptospermum scoparium*, Wellington, Lake Rotoaira, 30 Apr 1967, R.F.R. McNabb (PDD 26598).

Russula atrovirens R.F.R. McNabb, *N.Z. Jl Bot. 11*: 703-4, 1973
solitary or gregarious under *Nothofagus solandri*, Canterbury, Craigieburn, 5 Feb 1969, E. Horak (PDD 30655).

Russula aucklandica R.F.R. McNabb, *N.Z. Jl Bot. 11*: 727-30, 1973
gregarious under *Leptospermum ericoides*, Auckland, Titirangi, Bishop's Reserve, 13 Apr 1967, R.F.R. McNabb (PDD 26590).

Russula australis R.F.R. McNabb, *N.Z. Jl Bot. 11*: 686-7, 1973
solitary or in small groups under *Nothofagus fusca* and *N. menziesii*, Nelson, Maruia, 6 May 1968, R.F.R. McNabb (PDD 30662).

Russula cremeochracea R.F.R. McNabb, *N.Z. Jl Bot. 11*: 683-4, 1973
solitary or in small groups under *Nothofagus menziesii*, Nelson, Oparara, Fenian Track, 9 Jan 1968, R.F.R. McNabb (PDD 30661).

Russula griseobrunnea R.F.R. McNabb, *N.Z. Jl Bot. 11*: 696-7, 1973
solitary or gregarious under *Nothofagus menziesii*, Nelson, Oparara River, Fenian Track, 9 Jan 1968, R.F.R. McNabb (PDD 30624).

Russula griseostipitata R.F.R. McNabb, *N.Z. Jl Bot. 11*: 723-5, 1973
solitary or gregarious under *Nothofagus fusca* and *N. menziesii*, Nelson, Maruia, 21 Jan 1968, R.F.R. McNabb (PDD 30654).

Russula griseoviolacea R.F.R. McNabb, *N.Z. Jl Bot. 11*: 716-7, 1973
solitary or gregarious under *Nothofagus menziesii*, Nelson, Karamea, Umere, 5 Jan 1968, R.F.R. McNabb (PDD 30663).

Russula griseoviridis R.F.R. McNabb, *N.Z. Jl Bot. 11*: 701-2, 1973
solitary or scattered under *Leptospermum ericoides*, Auckland, Titirangi, Atkinson Park, 13 Nov [Feb] 1967, R.F.R. McNabb (PDD 26628).

Russula inquinata R.F.R. McNabb, *N.Z. Jl Bot. 11*: 694-6, 1973
solitary or in pairs under *Nothofagus menziesii*, Nelson, Karamea, Umere, 4 Jan 1970, A.Y. McNabb (PDD 30626).

Russula littoralis R.F.R. McNabb, *N.Z. Jl Bot. 11*: 681-3, 1973
solitary or in pairs under *Leptospermum scoparium*, Auckland, Bethell's Beach, 22 Mar 1967, R.F.R. McNabb (PDD 26940).

Russula macrocystidiata R.F.R. McNabb, *N.Z. Jl Bot. 11*: 709-11, 1973
solitary or gregarious under *Nothofagus menziesii*, Nelson, Karamea, Umere, 31 [8] Jan 1968, R.F.R. McNabb (PDD 30658).

Russula miniata R.F.R. McNabb, *N.Z. Jl Bot. 11*: 721-2, 1973
solitary under *Nothofagus menziesii*, Nelson, Karamea, Umere, 2 Jan 1968, R.F.R. McNabb (PDD 30652).

Russula multicystidiata R.F.R. McNabb, *N.Z. Jl Bot. 11*: 684-6, 1973
solitary under *Leptosperumum ericoides*, Auckland, Titirangi, Atkinson Park, 13 Mar 1967, R.F.R. McNabb (PDD 26936).

Russula novae-zelandiae R.F.R. McNabb, *N.Z. Jl Bot. 11*: 691-3, 1973
gregarious under *Nothofagus menziesii*, Nelson, Karamea, Umere, 5 Jan 1968, R.F.R. McNabb (PDD 30588).

Russula papakaiensis R.F.R. McNabb, *N.Z. Jl Bot. 11*: 678-80, 1973
gregarious under *Leptospermum scoparium*, Wellington, Lake Rotoaira, Papakai, 3 May 1967, R.F.R. McNabb (PDD 26605).

Russula pilocystidiata R.F.R. McNabb, *N.Z. Jl Bot. 11*: 713-4, 1973
solitary or in pairs under *Nothofagus menziesii*, Nelson, Oparara, Fenian Track, 9 Jan 1968, R.F.R. McNabb (PDD 30656).

Russula pseudoareolata R.F.R. McNabb, *N.Z. Jl Bot. 11*: 699-701, 1973
solitary or gregarious under *Nothofagus menziesii*, Nelson, Karamea, Umere, 15 Jan 1968, R.F.R. McNabb (PDD 30625).

Russula pudorina R.F.R. McNabb, *N.Z. Jl Bot. 11*: 722-3, 1973
solitary under *Leptospermum ericoides*, Auckland, Titirangi, Atkinson Park, 4 Apr 1967, R.F.R. McNabb (PDD 26574).

Russula purpureotincta R.F.R. McNabb, *N.Z. Jl Bot. 11*: 711-3, 1973
solitary or gregarious under *Nothofagus menziesii*, Nelson, L. Daniels track, 14 May 1969, R.F.R. McNabb (PDD 30657).

Russula rimosa R.F.R. McNabb, *N.Z. Jl Bot. 11*: 698-9, 1973
solitary or in pairs under *Leptospermum ericoides*, Auckland, Henderson Valley, Sharp's Bush, 6 Apr 1967, R.F.R. McNabb (PDD 26577).

Russula roseopileata R.F.R. McNabb, *N.Z. Jl Bot. 11*: 719-20, 1973
gregarious under *Nothofagus menziesii*, Nelson, Karamea, Umere, 8 Jan 1969, R.F.R. McNabb (PDD 30653).

Russula roseostipitata R.F.R. McNabb, *N.Z. Jl Bot. 11*: 708-9, 1973
solitary or gregarious under *Nothofagus solandri*, Canterbury, Kowai Bush, 5 Feb 1969, R.F.R. McNabb (PDD 30659).

Russula solitaria R.F.R. McNabb, *N.Z. Jl Bot. 11*: 693-4, 1973
solitary under *Nothofagus truncata*, Auckland, Rotorua, Mangorewa Gorge, 25 Apr 1967, R.F.R. McNabb (PDD 26566).

Russula subvinosa R.F.R. McNabb, *N.Z. Jl Bot. 11*: 725-6, 1973
solitary or occasionally in pairs under *Leptospermum ericoides*, Auckland, Titirangi, Atkinson Park, 7 Mar 1967, R.F.R. McNabb (PDD 26641).

Russula tawai R.F.R. McNabb, *N.Z. Jl Bot. 11*: 706-7, 1973
solitary or gregarious under *Nothofagus fusca*, Nelson, L. Daniels Track, 14 May 1969, R.F.R. McNabb (PDD 30660). Maori name for *Nothofagus* spp.

Russula tricholomopsis R.F.R. McNabb, *N.Z. Jl Bot. 11*: 704-6, 1973
solitary on rotten wood of *Nothofagus*, Auckland, Rotorua, Mangorewa Gorge, 25 Apr 1967, R.F.R. McNabb (PDD 26541).

Russula umerensis R.F.R. McNabb, *N.Z. Jl Bot. 11*: 715-6, 1973
solitary under *Nothofagus menziesii*, Nelson, Karamea, Umere, 2 Jan 1969, R.F.R. McNabb, R.J. McNabb (PDD 30664).

Russula vinaceocuticulata R.F.R. McNabb, *N.Z. Jl Bot. 11*: 687-9, 1973
solitary or gregarious under *Leptospermum ericoides*, Auckland, Titirangi, Bishop's Reserve, 6 Feb 1967, R.F.R. McNabb (PDD 26620).

Russula vivida R.F.R. McNabb, *N.Z. Jl Bot. 11*: 718-9, 1973 solitary under *Nothofagus solandri*, Wellington, Tongariro National Park, near Chateau, 1 May 1967, R.F.R. McNabb (PDD 26551).

Saprolegnia australis R.F. Elliott, *N.Z. Jl Bot. 6*: 103, 1968
fresh water streams and lakes, Auckland, Western Springs Reserve, [10 Oct 1962] (PDD 25944).

Sarcoscypha excelsa H. Sydow, *Ann. Mycol. 22*: 309-10, 1924
on sandy soil, Dunedin, 25 May 1922 [1921], H.K. Dalsymphe [Dalyrimple] (PDD 1048).

Schizochora calocarpa H. Sydow, *Ann. Mycol. 22*: 302, 1924
on leaves of *Dracophyllum traversii*, Otago, Mt Rolleston, 14 Dec 1920, E.H. Atkinson (PDD 961).

Schizonella isolepidis K. Vánky in Vánky & E.H.C. McKenzie, *N.Z. Jl Bot. 28*: 251, 1990
Isolepis nodosa, Bay of Plenty, Motuhora (Whale I.), 4 Jan 1986, R.E. Beever (PDD 56371, holotype HUV 14720, isotype BPI, BRIP).

Sclerocrana atra G.J. Samuels & L.M. Kohn, *Sydowia 39*: 210-4, 1986 (1987)
on rotting caudex of tree fern and on decaying log, Auckland, Waitemata City, Waitakere Ranges, Cascades, 16 Jul 1980, G.J. Samuels, P.R. Johnston (PDD 46958, isotype CUP).

Scoleciasis atkinsonii H. Sydow, *Ann. Mycol. 22*: 312, 1924
on leaves of *Veronica atkinsonii*, Wellington, York Bay, 24 Oct 1920, E.H. Atkinson (PDD 968). Named for collector, E.H. Atkinson.

Scutellinia colensoi (Massee) Le Gal ex M.A. Rifai, *Verh. K. ned. Akad. Wet. Afd. Natuurk. Tweede Sect. 57 (3)*: 116, 1968
on rotten wood, W. Colenso b1013 ([PDD 39963], holotype K) - *Lachnea colensoi* G. Massee, in herb. Named for collector, W. Colenso.

Sebacina cremea R.F.R. McNabb, *N.Z. Jl Bot. 7*: 249, 1969
on dead *Melicytus ramiflorus*, Auckland, Thames, Kauaeranga Valley, 26 Aug 1954, J.M. Dingley (PDD 25006).

Sebacina filicola R.F.R. McNabb, *N.Z. Jl Bot. 4*: 541, 1966
on dead stipes of *Dicksonia squarrosa*, Lake Rotoehu, 13 Dec 1953, G.H. Cunningham (PDD 24646).

Sebacina minutispora R.F.R. McNabb, *N.Z. Jl Bot. 7*: 249-50, 1969
on dead *Dysoxylon spectabile*, Auckland, Titirangi, Atkinson Park, 11 Dec 1966, R.F.R. McNabb (PDD 25608).

Sebacina nikau R.F.R. McNabb, *N.Z. Jl Bot. 7*: 248, 1969
on leaf base of *Rhopalostylis sapida*, Auckland, Waipoua State Forest, 20 Jan 1955, J.M. Dingley (PDD 25000). Maori name for host plant.

Sebacina novae-zelandiae R.F.R. McNabb, *N.Z. Jl Bot. 7*: 252, 1969
on dead *Quercus robur*, Auckland, Auckland Domain, 4 Jan 1966, R.F.R. McNabb (PDD 24930).

Sebacina pruinosa R.F.R. McNabb, *N.Z. Jl Bot. 7*: 243, 1969
on dead angiosperm wood, Auckland, Titirangi, Bishop's Reserve, 26 Dec 1966, R.F.R. McNabb, R.J. McNabb (PDD 25610).

Sebacina pteridicola R.F.R. McNabb, *N.Z. Jl Bot. 4*: 543, 1966
on dead stipe of *Pteridium aquilinum* var. *esculentum*, Wellington, Pohangina Reserve, 21 Aug 1954, G.H. Cunningham (PDD 24648).

Sebacina tawa R.F.R. McNabb, *N.Z. Jl Bot. 7*: 250, 1969
on dead *Beilschmiedia tawa*, Wellington, Lake Papaitonga, 8 Sep 1953, G.H. Cunningham (PDD 12619).

Secotium areolatum G.H. Cunningham, *N.Z. Jl Sci. Technol. 23*: 172b, 1942
on ground, Auckland, Swanson, [Mar 1942], J.M. Dingley [PDD 4595].

Secotium cartilagineus G.H. Cunningham, *Proc. Linn. Soc. N.S.W. 49*: 115-7, 1924
solitary on the ground in beech forest, Nelson, Dun Mt, 650 m, 27 May 1923, J.C. Neill (PDD 1099).

Secotium novae-zelandiae G.H. Cunningham, *Proc. Linn. Soc. N.S.W. 49*: 107, 1924
solitary or crowded on decaying wood buried in the substratum, Wellington, Weraroa, 100 m, 1 Aug 1919, G.H. Cunningham (PDD 874).

Secotium porphyreum G.H. Cunningham, *Proc. Linn. Soc. N.S.W. 49*: 114, 1924
solitary on the ground in beech forest (*Nothofagus* sp.), Wellington, York Bay, Beech Forest, 30 m, 5 Oct 1910 [1919], E.H. Atkinson [PDD 873].

Secotium superbum G.H. Cunningham, *Proc. Linn. Soc. N.S.W. 49*: 104-5, 1924
solitary on the ground in grassey places in the forest, Wellington, Upper Otaki River, Otaki Forks, 300 m, 8 Jun 1922 [2 Jun 1, J.G. Myers, E.H. Atkinson [J.G. Myers, Mrs Myers] (PDD 1094).

Seimatosporium leptospermi R.G. Bagnall & J.E. Sheridan, *N.Z. Jl Bot. 10*: 73, 1972
Leptospermum scoparium, Wellington [city], Nov 1965, R.W. Balham ([PDD 24869], holotype WELTU 9536, isotype DAOM 115277).

Septobasidium album E.A. Burt, *Ann. Mo. bot. Gdn 13*: 332, 1926
on bark of dead, fallen branches of *Nothofagus*, Otago, Queenstown, [3] Dec [1919], G.H. Cunningham (PDD 542, holotype MO 59315, isotype BPI, U.N.C. Herb).

Septoria cunninghamii H. Sydow, *Ann. Mycol. 22*: 312, 1924
on leaves of *Viola lyallii*, Auckland, Cambridge, 16 Jan 1920, G.H. Cunningham (PDD 1045). Named for G.H. Cunningham, New Zealand mycologist.

Septoria pulcherrima P.D. Gadgil & M. Dick, *N.Z. Jl Bot. 21*: 49, 1983
on living leaves of *Eucalyptus nitens*, near Kinleith, Feb 1981, R.M.J. MacKenzie (PDD 42838, holotype NZFRI 4).

Setigeroclavula ascendens R.H. Petersen, *Bull. N.Z. Dep. scient. ind. Res. 236*: 143 & 164, 1988
on dead rachises of *Asplenium bulbiferum*, Abel Tasman National Park, Coast Track, 19 May 1983, R.H. Petersen [PDD 58811].

Simocybe austrorubi E. Horak, *N.Z. Jl Bot. 18*: 194-5, 1980
on soil in broad-leaved forest (dominated by *Weinmannia, Dacrydium*, and *Fuchsia excorticata*), Stewart I., Christmas Village, 14 Mar 1969, E. Horak (PDD 27152, isotype ZT 69/132).

Simocybe luteomellea E. Horak, *N.Z. Jl Bot. 18*: 192-3, 1980
on bare or moss-covered soil in mixed forests dominated by *Podocarpus, Dacrydium*, and *Weinmannia*, West Coast, Hari Hari, Mt Hercules, 14 Feb 1969, E. Horak (PDD 27150, isotype ZT 69/73).

Simocybe phlebophora E. Horak, *N.Z. Jl Bot. 18*: 189-90, 1980
on rotten wood of *Nothofagus* (*N. menziesii, N. solandri* var. *cliffortioides*), Nelson, Lake Rotoiti, track to Albert Range, 26 Oct 1967, E. Horak (PDD 27147, isotype ZT 67/174).

Simocybe pruinata E. Horak, *N.Z. Jl Bot. 18*: 192, 1980
on rotten wood and bark of *Nothofagus* (*N. fusca, N. menziesii, N. solandri* var. *cliffortioides*), Southland, Denton Range, Te Anau, 30 Mar 1969, E. Horak (PDD 27149, isotype ZT 69/197).

Simocybe tabacina E. Horak, *N.Z. Jl Bot. 18*: 194, 1980
on rotting trunk of *Cordyline* sp., West Coast, Ahaura, Kopara, 12 Dec 1967, E. Horak (PDD 27151, isotype ZT 67/242).

Simocybe unica E. Horak, *N.Z. Jl Bot. 18*: 190-2, 1980
on rotten wood and bark of *Nothofagus* (*N. solandri* var. *cliffortioides*), West Coast, Ahaura, Nelson Creek near Kopara, 29 Mar 1968, E. Horak (PDD 27148, isotype ZT 68/222).

Solenia huia G.H. Cunningham, *Trans. R. Soc. N.Z. 81*: 179, 1953
crowded on bark of dead stems of *Leptospermum scoparium*, Auckland, Huia, 100 ft, Nov 1945, G.H. Cunningham [PDD 4392].

Sorosporium neillii G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 428, 1924
in inflorescences of *Scirpus nodosus*, Wellington, Seatoun, seashore, 6 [4] Dec 1923, J.C. Neill, G.H. Cunningham [PDD 38650]. Named for J.C. Neill.

Spadicoides sphaerospermum E.H.C. McKenzie, *N.Z. Jl Bot. 20*: 246, 1982
on dead leaves, sheaths, and stems of *Chionochloa ?rubra*, Taupo, Desert Road, 24 Apr 1976, E.H.C. McKenzie (PDD 34808).

Sphaerella majuscula M.C. Cooke, *J. Bot., Lond. 21*: 138, 1883
on dead leaves of *Senecio rotundifolius*, Stewart I., [Traills I.], T. Kirk [PDD 222].

Sphaerodothis calospora H. Sydow, *Ann. Mycol. 22*: 302, 1924
on leaves of *Danthonia pilosa*, Wellington, Tiritea, 4 Mar 1921, G.H. Cunningham (lectotype PDD 1053).

Sphaeropsis cordylines G.F. Laundon, *Trans. Br. mycol. Soc. 60*: 333, 1973
on living leaves of *Cordyline australis*, Auckland, Ruakura, [22] Jan 1924, J.C. Neill, G.H. Cunningham (PDD 1587).

Sphaerostilbella novaezelandiae K.A. Seifert, G.J. Samuels & W. Gams, *Stud. Mycol. 27*: 153-4, 1985
basidiomata of polypores, Buller District, near Lyell, 26 km S of Murchison, 16 Apr 1983, G.J. Samuels, [R.E. Beever, P.R. Johnston, R.H. Petersen] (PDD 44258, cultotype CBS 648.83). Anamorph = *Gliocladium novaezelandiae* Seifert, Samuels & Gams.

Spilocaea amelanchieris I.C. Harvey in Harvey & M. Braithwaite, *N.Z. Jl. agric. Res. 25*: 441, 1982
scab disease on leaves of *Amelanchier* sp., Canterbury, Christchurch, [Memorial Ave., 9] Nov 1978, R.C. Close (PDD 41810, holotype IMI 233721).

Sporidesmium hyalospermum (Corda) Hughes var. ***novae-zelandiae*** S.J. Hughes, *N.Z. Jl Bot. 16*: 349, 1978
on rotten wood, Canterbury Province, Okuti Valley, near Little River, 17 May 1963, S.J. Hughes (PDD 30420, isotype DAOM 159962).

Sporoschismopsis dingleyae S.J. Hughes & G.L. Hennebert in Hughes, *N.Z. Jl Bot. 16*: 350, 1978
on rotten wood of *Elaeocarpus dentatus*, Auckland Prov., Waitakere Range, Upper Piha Valley, [Home Track], 9 Oct 1963, J.M. Dingley (PDD 21602, isotype DAOM 93576). Named for J.M. Dingley, New Zealand mycologist.

Squamanita squarrulosa G.S. Ridley, *Persoonia 13*: 459, 1988
ground under *Nothofagus truncata*, Rimutaka Forest Park, Orongorongo track, 4 Sep 1986, G.S. Ridley (PDD 49071).

Stachybotrys breviusculus E.H.C. McKenzie, *Mycotaxon 41*: 180-3, 1991
on dead leaves of *Freycinetia baueriana* ssp. *banksii*, Northland, Puketi, 23 Oct 1987, E.H.C. McKenzie, P.R. Johnston (PDD 57594).

Stachybotrys freycinetiae E.H.C. McKenzie, *Mycotaxon 41*: 183-5, 1991
on dead leaves of *Freycinetia baueriana* ssp. *banksii*, Waikato, Mt Pirongia, Track 3, 19 Nov 1984, E.H.C. McKenzie (PDD 57639).

Steccherinum resupinatum G.H. Cunningham, *Trans. R. Soc. N.Z. 85*: 596, 1958
effused on bark and decorticated wood of dead branches of *Coprosma australis*, Auckland, Mamaku Forest, 1800 ft, [11] Sep 1954, G.H. Cunningham (PDD 17708).

Stenella gahniae E.H.C. McKenzie, *N.Z. Jl Bot. 20*: 248, 1982
on living leaves of *Gahnia setifolia*, Auckland, Auckland Domain, 28 Sep 1978, W.S.M. Versluys, E.H.C. McKenzie (PDD 38658).

Stereum aotearoa G.H. Cunningham, *Trans. R. Soc. N.Z. 84*: 212, 1956
on bark or decorticated decaying wood of erect trunks of *Beilschmiedia tarairi*, Auckland, Ngaitonga Range, Russell Road, 300 ft, Jun 1948, J.M. Dingley (PDD 6909). Maori name for New Zealand.

Stereum phaeum M.J. Berkeley in J.D. Hooker, *Flora Novae-Zelandiae 2*: 183, 1855
on dead wood, Bay of Islands, J.D. Hooker [PDD 35794, holotype K].

Stereum scutellatum G.H. Cunningham, *Trans. R. Soc. N.Z. 84*: 210-2, 1956
loosely attached on bark of dead branches and trunks of *Metrosideros robusta*, Auckland,

Whangarei, Ngaururu, Jun 1948, J.M. Dingley (PDD 7019).

Stictis asteliae P.R. Johnston, *N.Z. Jl Bot. 21*: 252, 1983
on dead leaves of *Astelia solandri*, Gisborne, Lake Waikaremoana, Aniwaniwa Falls Track, 28 May 1981, P.R. Johnston, E. Horak (PDD 41859).

Stictis clavata P.R. Johnston, *N.Z. Jl Bot. 21*: 256, 1983
on dead tissue of *Melicytus* sp., Auckland, Waitakere Ranges, Mill Bay, 17 Nov 1981, P.R. Johnston (PDD 41847).

Stictis collospermi P.R. Johnston, *N.Z. Jl Bot. 21*: 256, 1983
on dead leaves of *Collospermum hastatum*, Auckland, Waitakere Ra., Fairy Falls Track, 14 Aug 1981, P.R. Johnston, G.J. Samuels, J.M. Dingley, R. Korf (PDD 41858).

Stictis cordylinae [cordylines] P.R. Johnston, *N.Z. Jl Bot. 21*: 257, 1983
on dead leaves of *Cordyline australis*, Auckland, Northcote, Kauri Glen, 16 Mar 1981, P.R. Johnston, M.E. Lanigan (PDD 41865).

Stictis dealbata P.R. Johnston, *N.Z. Jl Bot. 21*: 259, 1983
on dead fronds of *Cyathea dealbata*, Auckland, Waitakere Ra., Parau Dam, 23 Oct 1980, P.R. Johnston, G.J. Samuels (PDD 41873).

Stictis dicksoniae M.A. Sherwood, *Mycotaxon 5*: 171-4, 1977
on stipes of *Dicksonia squarrosa*, Stewart I., Horseshoe Bay, near track, 17 Feb 1954, J.M. Dingley (PDD 32648).

Stictis inconstans P.R. Johnston, *N.Z. Jl Bot. 21*: 261, 1983
on dead wood of *Ripogonum scandens*, Auckland, Waitakere Ra., Parau Track, 23 Oct 1980, P.R. Johnston, G.J. Samuels (PDD 41848).

Stictis laciniata P.R. Johnston, *N.Z. Jl Bot. 21*: 263, 1983
on dead fronds of *Cyathea dealbata*, Auckland, Waitakere Ra., Chateau-Mosquito Track, 19 Jan 1982, P.R. Johnston (PDD 41877).

Stictis lata P.R. Johnston, *N.Z. Jl Bot. 21*: 264, 1983
on dead leaves of *Cordyline australis*, Auckland, Waitakere Ra., Kakamatua Stream, 12 Nov 1980, P.R. Johnston (PDD 41849).

Stictis paucula P.R. Johnston, *N.Z. Jl Bot. 21*: 265, 1983
on dead wood, Auckland, Waitakere Ra., Kitekite Track, 3 Sep 1980, P.R. Johnston, G.J. Samuels, M.E. Lanigan (PDD 41868).

Stictis ramuligera Stärback var. ***minor*** P.R. Johnston, *N.Z. Jl Bot. 21*: 268-9, 1983
on dead fronds of *Rhopalostylis sapida*, Auckland, Waitakere Ra., Fairy Falls Track, 13 [14] Aug 1981, P.R. Johnston, G.J. Samuels, R. Korf, J. Paden (PDD 41004).

Stictis subiculata P.R. Johnston, *N.Z. Jl Bot. 21*: 271, 1983
on dead leaves of *Freycinetia baueriana* ssp. *banksii*, Auckland, Waitakere Ra., Cascades Track, 9 Mar 1981, P.R. Johnston, G.J. Samuels (PDD 41899).

Stictis tortilis P.R. Johnston, *N.Z. Jl Bot. 21*: 273, 1983
on dead wood, Nelson, Motueka, vic. Pokororo, Graham River Valley, 14 May 1982, G.J. Samuels, P.R. Johnston, R.H. Petersen (PDD 42783).

Stictis trinervia P.R. Johnston, *N.Z. Jl Bot. 21*: 274, 1983
on dead leaves of *Astelia trinervia*, Northland, Waipoua State Forest, Yakas Track, 30 May 1982, P.R. Johnston, G.J. Samuels (PDD 42782).

Suillus subacerbus R.F.R. McNabb, *N.Z. Jl Bot. 6*: 166-8, 1968
gregarious or caespitose under *Pinus radiata*, Auckland, Woodhill State Forest, 23 May 1966, G.T. Jane (PDD 25207).

Synchytrium hypochoeridis J.S. Karling, *Sydowia 20*: 51-2, 1966 (1968)
parasitic on *Hypochoeris radicata*, Auckland, Sharp's Bush, [6 Nov 1965, J.S. Karling] ([PDD 26297], isotype PU).

Synchytrium leontodontis J.S. Karling, *Sydowia 20*: 55, 1966 (1968)
parasitic on *Leontodon leysseri*, Wellington, Upper Hutt, 21 Mar 1953, A.J. Healy (PDD 24308).

Synchytrium limosellae J.S. Karling, *Sydowia 20*: 56-7, 1966 (1968)
parasitic on *Limosella lineata*, Central Otago, Ranfurly, 21 [23] Jan 1957, A.J. Healy (PDD 25212 [26298]).

Tarzetta jafneospora W.-Y. Zhuang & R.P. Korf, *Mycotaxon 28*: 365-6, 1987
on sandy soil, Gisborne, Urewera Nat. Park, L. Waikaremoana, Waikareiti Tr., 2 May 1981, G.J. Samuels, A.P. Hawthorne, P.R. Johnston, E. Horak, R.H. Petersen (PDD 49572, isotype CUP 61778).

Thaxterogaster anisodorum E. Horak, *Beih. Nova Hedwigia 43*: 107-8, 1973
on ground amongst litter of *Nothofagus cliffortioides, N. menziesii* and *N. fusca*, Prov. Nelson, Lake Rotoiti, Mt Robert, 2 May 1968, E. Horak (PDD 27068, isotype ZT 68/343).

Thaxterogaster aurantiacum E. Horak, *Beih. Nova Hedwigia 43*: 104-5, 1973
in soil amongst litter, under *Leptospermum scoparium, Knightia* sp., *Cyathea* sp., etc., Auckland, Titirangi Rge., Atkinson Park, 8 Oct 1967, R.F.R. McNabb, E. Horak (PDD 27066, isotype ZT 67/151).

Thaxterogaster carneolum E. Horak, *Beih. Nova Hedwigia 43*: 102, 1973
on ground amongst mosses under *Nothofagus cliffortioides*, Prov. Canterbury, Craigieburn Rge., Camp Stream, 3 Nov 1967, E. Horak (PDD 27065, isotype ZT 67/182).

Thaxterogaster epiphaeum E. Horak, *Beih. Nova Hedwigia 43*: 100-1, 1973
on ground under *Nothofagus cliffortioides, N. fusca* and *N. menziesii*, Prov. Canterbury, Craigieburn Rge., Cass, 31 Mar 1968, M.J. Moonan (PDD 27064, isotype ZT 68/670).

Thaxterogaster leoninum E. Horak, *Beih. Nova Hedwigia 43*: 98-100, 1973
on ground amongst litter of *Nothofagus cliffortioides*, in montane forests, Prov. Canterbury, Craigieburn Rge., Cave Stream, 14 Nov [Oct] 1967, E. Horak (PDD 27063, isotype ZT 67/153).

Thaxterogaster luteolum E. Horak, *Beih. Nova Hedwigia 43*: 105-6, 1973
on ground amongst litter under *Nothofagus cliffortioides* and *N. solandri*, Canterbury, Mt Grey, Kowai Bush, 15 Oct [Sep] 1967, E. Horak (PDD 27067, isotype ZT 67/102).

Thaxterogaster napivelatum E. Horak, *Beih. Nova Hedwigia 43*: 110-2, 1973
on ground under *Nothofagus fusca, N. menziesii* and *N. cliffortioides*, Prov. Nelson, Lake Rotoiti, Track to St. Arnaud Rge., 5 May 1968, E. Horak (PDD 27069, isotype ZT 68/381).

Thaxterogaster nivale E. Horak, *Beih. Nova Hedwigia 43*: 89, 1973
on ground amongst mosses and litter under *Nothofagus fusca, N. menziesii, N. cliffortioides* and *Leptospermum* spp., Prov. Nelson, Lake Rotoiti, Track to Mt Robert, 21 May 1968, E. Horak (PDD 27060, isotype ZT 68/492).

Thaxterogaster pisciodorum E. Horak, *Beih. Nova Hedwigia 43*: 97-8, 1973
on ground under *Nothofagus cliffortioides* and *N. solandri*, Prov. Canterbury, Mt Grey, Kowai Bush, 15 Sep 1967, Benecke, E. Horak (PDD 27062, isotype ZT 67/103).

Thaxterogaster violaceovolvatum E. Horak, *Beih. Nova Hedwigia 43*: 95-6, 1973
on ground under *Nothofagus cliffortioides, N. menziesii*, and *N. fusca*, Prov. Nelson, Lake Rotoiti, Track to St. Arnaud Rge., 5 May 1968, E. Horak (PDD 27061, isotype ZT 68/382).

Tolyposporium littorale G.H. Cunningham, *Trans. Proc. N.Z. Inst. 56*: 77-8, 1926
in ovaries of *Cladium huttoni*, Auckland, Tauranga Harbour, seashore, 20 Jan 1924, J.C. Neill, G.H. Cunningham (PDD 1640).

Tomentella scobinella G.H. Cunningham, *Trans. R. Soc. N.Z. 84*: 485, 1957
effused on decorticated decayed wood of *Nothofagus fusca*, Westland, Reefton, Staircase Creek, 2000 ft, [29] Nov 1952, S.D. Baker (PDD 15892).

Trabutia nothofagi H. Sydow, *Ann. Mycol. 22*: 301, 1924
on leaves of *Nothofagus fusca*, Otago, Rere Lake, 5 Apr 1922, W.D. Reid (PDD 987).

Trametes tawa G.H. Cunningham, *Bull. Plant Dis. Div. N.Z. Dep. scient. ind. Res. 80*: 2-3 & 9, 1948
usually imbricate, sometimes resupinate, upon bark of dead upright branches of *Pittosporum* sp., Southland, Woodlaw State Forest, Nov 1946, G.B. Rawlings [PDD 4822]. Maori name

for one of the hosts, *Beilschmiedia tawa*.

Tremella tawa R.F.R. McNabb in R.J. Bandoni & P.K. Buchanan, *N.Z. Jl Bot. 28*: 451-2, 1990
on *Beilschmiedia tawa*, Bay of Plenty, Mamaku Ranges, 2 Jan 1967, R.F.R. McNabb (PDD 26089).

Tremella vesiculosa R.F.R. McNabb in R.J. Bandoni & P.K. Buchanan, *N.Z. Jl Bot. 28*: 452-3, 1990
on angiosperm wood, Waikato, Waikaretu Valley, 29 Jan 1943 [1945], E.E. Chamberlain (PDD 4389).

Tremellodendropsis flagelliformis (Berk.) Crawford var. ***ovalispora*** D.A. Crawford, *Trans. R. Soc. N.Z. 82*: 621, 1954
Wellington, Tararua Ranges, Quoin Ridge, [8 Jul 1948, D.A. Crawford] [PDD 44749].

Tremellodendropsis transpusio D.A. Crawford, *Trans. R. Soc. N.Z. 82*: 624, 1954
on ground under *Beilschmiedia tawa*, Wellington, Keith George Memorial Park, [10] Jun 1949, [D.A. Crawford] [PDD 44743].

Tremellodendropsis transpusio Crawford var. ***inflata*** D.A. Crawford, *Trans. R. Soc. N.Z. 82*: 625, 1954
on ground under *Nothofagus truncata*, Nelson, Rai Valley, Jul 1949, [D.A. Crawford] [PDD 44746].

Tremellodendropsis transpusio Crawford var. ***minor*** D.A. Crawford, *Trans. R. Soc. N.Z. 82*: 625, 1954
on ground, Wellington, Keith George Memorial Park, Jun 1949, [D.A. Crawford] [PDD 44754].

Trichocladium novae-zelandiae S.J. Hughes, *N.Z. Jl Bot. 7*: 153-4, 1969
on dead, fallen leaf-sheaths of *Rhopalostylis sapida*, Auckland Province, Coromandel Peninsula, Whangapoua Saddle, 5 Sep 1963, S.J. Hughes (PDD 21492, isotype DAOM 96235a).

Trichonectria horrida G.J. Samuels, *Mem. N.Y. bot. Gdn 48*: 13, 1988
on pyrenomycete (?*Chaetosphaeria*), Auckland, Waitemata City, Waitakere Ranges, Swanson, 7 May 1981, G.J. Samuels, P.R. Johnston, E. Horak [PDD 56048].

Trichoscyphella phyllocladi R.W.G. Dennis, *Kew Bull. 15*: 302, 1962
on bark of *Phyllocladus alpinus*, Canterbury, Arthur's Pass, 960 m, 17 Jan 1956, J.M. Dingley (PDD 18990).

Trichosphaerella tuberculata G.J. Samuels, *N.Z. Jl Bot. 21*: 158-61, 1983
on decorticated wood of *Leptospermum* sp., Auckland, Waitakere Ranges, Huia, Parau Track, 23 Oct 1980, G.J. Samuels, P.R. Johnston (PDD 41946).

Trimmatostroma bifarium P.D. Gadgil & M. Dick, *N.Z. Jl Bot. 21*: 49, 1983
on living leaves of *Eucalyptus regnans*, near Kinleith, Sep 1981, D.J. Rawcliffe (PDD 42845, holotype NZFRI 5).

Trimmatostroma excentricum B.C. Sutton & A. Ganapathi, *N.Z. Jl Bot. 16*: 529, 1978
in living and dead leaves of *Eucalyptus delegatensis*, Tokoroa, April 1977, R. Beresford (PDD 37675, holotype IMI 225395a).

Tubulicrinis callosa G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 145*: 144-5 & 332, 1963
effused on bark of dead trunks and branches of *Nothofagus fusca*, Nelson, Orwell Creek, Ahaura, 120 m, [26 Apr 1953, J.M. Dingley] (PDD 17432).

Tubulicrinis cincta G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 145*: 142-3 & 332, 1963
effused on bark of dead branches of *Dacrydium cupressinum*, Westland, Weheka, 200 m, [4 Nov 1954, J.M. Dingley] (PDD 17428).

Tubulicrinis filicicola G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 145*: 138 & 332, 1963
effused on trunks of *Cyathea dealbata*, Auckland, Waitakere Ranges, Mountain Road, 300 m, [11 Jun 1955, J.M. Dingley] (PDD 17426).

Tubulicrinis hastata G.H. Cunningham, see *Peniophora hastata*.

Tuburcinia novae-zelandiae G.H. Cunningham, *Trans. Proc. N.Z. Inst. 59*: 504, 1928
Ranunculus tenuicaulis, Westland, Mt Mantell, 1800 m, Feb 1928, G.H. Cunningham [PDD 3414].

Tyromyces falcatus G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 164*: 133 & 262, 1965
on decorticated wood of *Nothofagus fusca*, Westland, Orwell Creek, Ahaura, 600 m, [26 Apr 1955, J.M. Dingley] (PDD 15612).

Tyromyces stramenticus G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 164*: 124 & 262, 1965
on decorticated wood of *Nothofagus cliffortioides*, Wellington, Mt Ruapehu, Whakapapaiti Stream, 1300 m, [Jan 1951, J.M. Dingley] (PDD 11038).

Tyromyces toatoa G.H. Cunningham, *Bull. N.Z. Dep. scient. ind. Res. 164*: 117 & 262, 1965
on dead bark of *Phyllocladus alpinus*, Wellington, Whakapapa Stream, Mt Ruapehu, 1000 m, [19 Oct 1949, J.M. Dingley] (PDD 7792). Maori name for another host, *P. glaucus*.

Ulocoryphus mastigophorus J. Michaelides, L. Hunter, W.B. Kendrick, *Mycotaxon 14*: 62-3, 1982
on leaf and twig litter of *Agathis australis*, Auckland, Waitakere Ranges, unmarked Tr. off Scenic Drive, 27 Feb 1974, W.B. Kendrick (PDD 34193).

Uredo acaciae M.C. Cooke, *Grevillea 19*: 3, 1890
on living young twigs of *Acacia* [*dealbata*], W. Colenso [b]1050 [PDD 40194, holotype K]. Teleomorph = *Uromycladium bisporum* McAlpine.

Uredo celmisiae M.C. Cooke, *Grevillea 14*: 89, 1886
on leaves of *Celmisia coriacea*, Arthur's Pass, T. Kirk [PDD 9184, holotype K]. Teleomorph = *Puccinia celmisiae* G.H. Cunningham.

Uredo chathamica E.H.C. McKenzie, *Mycotaxon 41*: 309, 1991
Carex chathamica, Chatham I., Rekohu, Owenga, 11 Mar 1983, E.H.C. McKenzie (PDD 44228).

Uredo cheesemanii G.H. Cunningham, *Trans. Proc. N.Z. Inst. 59*: 500, 1928
Senecio adamsii, Nelson, Mt Arthur Plateau, T.F. Cheeseman [PDD 10074]. Named for collector, T.F. Cheeseman.

Uredo crinitae G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 41 & 54, 1924
on leaves of *Dichelachne crinita*, Banks Peninsula, Akaroa, 300 m, 16 Jan 1922, W.D. Reid (PDD 760). Teleomorph = *Puccina crinitae* McNabb.

Uredo forsterae G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 394 & 396, 1924
on leaves of *Forstera bidwillii*, Taranaki, Mt Egmont, 1000 m, 2 Feb 1923, E.H. Atkinson (PDD 1272 [3435]).

Uredo haumata G.H. Cunningham, *Trans. Proc. N.Z. Inst. 59*: 499, 1928
Danthonia cunninghamii, Canterbury, Mt Cook, Tasman Moraine, 800 m, Jan 1928, G.H. Cunningham [PDD 3395]. Teleomorph = *Uromyces macnabbii* Cummins.

Uredo horopito G.H. Cunningham, *Trans. Proc. R. Soc. N.Z. 75*: 326, 1945
Pseudowintera axillaris, Wellington, Hutt Valley, Belmont Trig, [1] Jan 1934, J.G. Gibbs [PDD 9801]. Maori name for host plant.

Uredo inflata M.C. Cooke, *Grevillea 19*: 48, 1890
on living leaves of *Ligusticum latifolium*, Campbell I., T. Kirk [PDD 41, holotype K].

Uredo karetu G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 41 & 54, 1924
on leaves of *Hierochloe redolens*, Southland, Bluff, sea-level, 26 May 1922, W.D. Reid (PDD 762). Maori name for host plant.

Uredo moschatus G.H. Cunningham, *Trans. Proc. N.Z. Inst. 59*: 499, 1928
Olearia moschata, Canterbury, Mt Cook, Black Birch Creek, 1200 m, Jan 1928, G.H. Cunningham [PDD 3379]. Teleomorph = *Puccinia moschata* G.H. Cunningham.

Uredo novae-zelandiae G.F. Laundon, *Mycol. Pap. 91*: 16, 1963

Tetragonia expansa, [Palmerston North], Apr 1933, [J.G. Gibbs] ([PDD 4016], holotype IMI 53688).

Uredo oleariae M.C. Cooke, *Grevillea 19*: 48, 1890
on living leaves of *Olearia lyallii*, [Auckland Islands], Port Ross, [1890], T. Kirk [PDD 42, holotype K].

Uredo phormii G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 42 & 54, 1924
on leaves of *Phormium tenax*, Wellington, Plimmerton, 20 m, 16 Jan 1922, R. Waters, H. Drake, G.H. Cunningham (PDD 755, 775 - both part of same collection).

Uredo puawhananga G.T.S. Baylis, *Trans. R. Soc. N.Z. 82*: 635, 1954
on leaves of *Clematis indivisa*, Dunedin, Swampy Spur, 1200 ft, 1 Mar 1954, G.T.S. Baylis (PDD 12908). Maori name for host plant.

Uredo salicorniae G.H. Cunningham, *Trans. Proc. N.Z. Inst. 61*: 417, 1930
Salicornia australis, Canterbury, Lake Ellesmere, coast, [Jan 1929], H.H. Allan [PDD 9812].

Uredo schoenus G.H. Cunningham, *Trans Proc. N.Z. Inst. 59*: 499, 1928
Schoenus pauciflorus, Canterbury, Cook Range, 700 m, Jan 1928, G.H. Cunningham [PDD 3405]. Teleomorph = *Puccinia schoenus* G.H. Cunningham.

Uredo southlandicus G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 44 & 55, 1924
on leaves of *Olearia angustifolia*, Southland, Bluff, sea-level, 26 May 1922, L. Cockayne (PDD 753).

Uredo toetoe G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 41 & 55, 1924
on leaves of *Arundo conspicua* [*Cortaderia toetoe*], Wellington, Levin, sandhills, 16 m, 12 Oct 1922, E.H. Atkinson, G.H. Cunningham (PDD 759 [1313]). Maori name for host plant.

Uredo tupare G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 44 & 55, 1924
on leaves of *Olearia colensoi*, Wellington, Mt Waiopehu, 1700 m, 26 Oct 1919, G.H. Cunningham (PDD 758). Maori name for host plant.

Uredo wharanui G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 46 & 55, 1924
on leaves of *Olearia insignis*, Marlborough, Wharanui, Woodside Creek, 3 Nov 1922, E.H. Atkinson (PDD 778).

Uromyces azorellae M.C. Cooke, *Grevillea 19*: 2, 1890
on leaves and petioles of *Pozoa trifoliata*, [Gaultheria wood], W. Colenso b866 [PDD 40193, holotype K]. *Azorella*, alternative name for host genus.

Uromyces discariae G.H. Cunningham, *Trans. Proc. N.Z. Inst. 54*: 634-5 & 691, 1923
on leaves of *Discaria toumatou*, Otago, Paradise, 500 m, 11 Dec 1921 [3 Apr 1921], W.D. Reid [PDD 1344].

Uromyces edwardsiae G.H. Cunningham, *Trans. Proc. N.Z. Inst. 55*: 392 & 395-6, 1924
on pods of *Edwardsia tetraptera* (= *Sophora tetraptera*), Southland, Catlins, Tahakopa, 70 m, Mar 1923 [Feb 1922], C.M. Smith (PDD 1234). Anamorph = *Aecidium kowhai* G.H. Cunningham.

Uromyces m[a]cnabbii G.B. Cummins, The Rust Fungi of Cereals, Grasses and Bamboos: 483, 1971
Danthonia raoulii var. *rubra*, Canterbury, Boyle River, 23 Feb 1961, R.F.R. McNabb [PDD 19862], F16460). Named for collector, R.F.R. McNabb.

Uromyces otakou G.H. Cunningham, *Trans. Proc. N.Z. Inst. 54*: 627 & 691, 1923
on leaves and sheaths of *Poa caespitosa*, Otago, Routeburn Valley, 800 m, 6 May 1921, W.D. Reid (PDD 363 [1323]).

Uromyces sellieriae G.H. Cunningham, *Trans. Proc. N.Z. Inst. 61*: 413, 1930
Selliera radicans, Wellington, Evans Bay, 5 m, [2 Feb 1921], E.H. Atkinson [PDD 1345].

Uromyces waipoua R.F.R. McNabb, *N.Z. Jl Bot. 4*: 91-2, 1966
Hypericum japonicum, Auckland, Waipoua State Forest, 23 Apr 1964, R.F.R. McNabb (PDD 23501).

Ustilago asprellae G.H. Cunningham, *Trans. Proc. N.Z. Inst. 61*: 417, 1930
Asprella gracilis, Nelson, Korere, 500 m, [Feb 1929], H.H. Allan [PDD 3472].

Ustilago gardnerii E.H.C. McKenzie & K. Vánky in K. Vánky, *Mycotaxon 41*: 486, 1991
Cyperus ustulatus f. *grandispiculosus*, Auckland, Western Springs Lake, 17 Feb 1989, R.O. Gardner (PDD 57462).

Vararia cunninghamii J. Boidin & P. Lanquetin, *Bull. Soc. mycol. Fr. 91*: 461, 1975 (1976)
on wood of *Nothofagus* [*fusca*, Westland, Ahaura, Orwell Creek, 12 Nov 1954, J.M. Dingley] (PDD 13752). Named for G.H. Cunningham, New Zealand mycologist.

Vararia ellipsospora G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 979-80, 1955
effused on bark of dead branches of *Rhipogonum scandens*, Wellington, Carterton, Carter's Bush, 150 ft, [18] Dec 1952, G.H. Cunningham (PDD 11849).

Vararia fusispora G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 977-9, 1955
effused on bark of dead branches of *Rubus australis*, Wellington, Carterton, Carter's Bush, 150 ft, [18] Dec 1952, G.H. Cunningham (PDD 11838).

Vararia protrusa G.H. Cunningham, *Trans. R. Soc. N.Z. 82*: 976, 1955
effused on bark of dead branches of *Leptospermum ericoides*, Auckland, Cornwallis, [9] Nov 1952, J.D. Atkinson (PDD 11859).

Venturia asperata G.J. Samuels & A. Sivanesan, *N.Z. Jl Bot. 13*: 646-50, 1975
on fallen, overwintered leaves of *Malus sylvestris* cv. 'Dougherty', Auckland Province, Waitemata County, Oratia, (Plant Diseases Division, DSIR) Research Orchard, Aug 1973, P.J. Brook, G.J. Samuels, M.A. Manning (PDD 32263, isotype IMI 186580). Anamorph = *Fusicladium* sp.

Venturia enteleae J.M. Dingley, *N.Z. Jl agric. Res. 8*: 907-8, 1965
on leaves of *Entelea arborescens*, Auckland, Waitakere Ra., [Cascades Kauri Park], Waitakere Stream, [11] Nov 1961, J.M. Dingley (PDD 20003).

Veronaea filicina J.M. Dingley, *N.Z. Jl Bot. 10*: 81, 1972
on ascomata of *Rhagadolobium bakerianum*, Auckland, Waitakere Ra., Sharp's Bush, 30 Aug 1969, J.M. Dingley (PDD 28170).

Vestergrenia leucopogonis C.G. Hansford, *Proc. Linn. Soc. N.S.W. 82*: 219, 1957
on leaves of *Leucopogon fasciculatus*, Auckland, [Piha, 27 Oct 1956], J.M. Dingley (PDD 17246).

Vibrissea albofusca G. Beaton in Beaton & G. Weste, *N.Z. Jl Bot. 21*: 281-2, 1983
on unexposed [exposed] roots of dead tree, Auckland, vic. Hunua, Mangitangi Dam, c. 300-600 m, 30 Jul 1980, G.J. Samuels, P.R. Johnston (PDD 42916).

Wrightoporia novae-zelandiae M. Rajchenberg & A. David, *N.Z. Jl Bot. 28*: 185, 1990
Nothofagus fusca, Wellington, Butterfly Gully, Gollans Valley, May 1947, G.B. Rawlings (PDD 5469).

Xenosporium boivinii S.J. Hughes, *N.Z. Jl Bot. 16*: 354, 1978
on dead rachids of *Rhopalostylis sapida*, Auckland Prov., Titirangi, 27 Feb 1963, [S.J. Hughes, J.M. Dingley] (PDD 20620, isotype DAOM 93842). Named for Dr Bernard Boivin.

Xerocomus aurantiacus R.F.R. McNabb, *N.Z. Jl Bot. 6*: 146, 1968
gregarious or caespitose under *Nothofagus menziesii*, Otago, Tapanui, Black Gully, 30 Mar 1966, R.F.R. McNabb (PDD 25175).

Xerocomus griseo-olivaceus R.F.R. McNabb, *N.Z. Jl Bot. 6*: 151-2, 1968
solitary under *Leptospermum ericoides*, Auckland, Henderson Valley, Sharp's Bush, 26 Jan 1966, R.F.R. McNabb (PDD 25165).

Xerocomus m[a]crobbii R.F.R. McNabb, *N.Z. Jl Bot. 6*: 147, 1968
gregarious or occasionally caespitose under *Nothofagus fusca* and *N. menziesii*, Nelson, Maruia, Jackson's Creek, 23 Mar 1966, R.F.R. McNabb (PDD 25242). Named for J.A. McRobb.

Xerocomus nothofagi R.F.R. McNabb, *N.Z. Jl Bot. 6*: 149-50, 1968
solitary or caespitose under *Nothofagus menziesii*, Otago, Catlins, Puketiro Reserve, 29 Mar 1966, R.F.R. McNabb (PDD 25168).

Xerocomus rufostipitatus R.F.R. McNabb, *N.Z. Jl Bot. 6*: 150-1, 1968 solitary under *Nothofagus fusca*, Nelson, Maruia, 23 Mar 1966, J.A. McRobb (PDD 25254).

Xerocomus scabripes R.F.R. McNabb, *N.Z. Jl Bot. 9*: 356, 1971
solitary under *Nothofagus menziesii*, Nelson, Karamea, Umere, 8 Jan 1968, R.F.R. McNabb (PDD 26515).

Xerocomus squamulosus R.F.R. McNabb, *N.Z. Jl Bot. 6*: 148-9, 1968
solitary, gregarious or occasionally caespitose under *Nothofagus solandri*, Canterbury, Ashley Gorge, 25 Mar 1966, R.F.R. McNabb (PDD 25167).

Xeromphalina podocarpi E. Horak, *Sydowia 32*: 136-7, 1979
on rotten conifer wood (*Podocarpus dacrydioides*), Westcoast, Ahaura, 14 Mar 1968, E. Horak (PDD 27154, isotype ZT 68/157).

Xeromphalina testacea E. Horak, *Sydowia 32*: 135-6, 1979
on rotting trunk of *Cyathea* sp., Coromandel Peninsula, Kirikiri Valley, 10 Jul 1968, E. Horak (PDD 27153, isotype ZT 68/663).

Xylaria luteostromata Lloyd var. ***macrospora*** J.D. Rogers & G.J. Samuels, *N.Z. Jl Bot. 24*: 621-3, 1986
on decorticated wood of *Dacrydium cupressinum*, Taupo, Lake Okataina, 1500 ft, 20 Jun 1951, J.M. Dingley (PDD 45397).

Xylaria theissenii Lloyd var. ***macrospora*** J.D. Rogers & G.J. Samuels, *N.Z. Jl Bot. 24*: 644-8, 1986
on well rotted wood of *Nothofagus* sp., Gisborne, Urewera National Park, 15 km SE of Ruatahuna along State Highway 38, Taupeupe Saddle, 3 Nov 1982, G.J. Samuels et al., [P.K. Buchanan, P.R. Johnston] (PDD 44428).

Xylaria wellingtonensis J.D. Rogers & G.J. Samuels, *N.Z. Jl Bot. 24*: 627, 1986
decorticated wood, Wellington, 22 Jul [Sep] 1916 (PDD 39920).

Xylohypha novae-zelandiae S.J. Hughes & J. Sugiyama, *N.Z. Jl Bot. 10*: 453, 1972
on dead wood, Auckland Province, Waitakere Range, Upper Piha Valley, McKenzie's Track, 2 May 1963, S.J. Hughes (PDD 29449, isotype DAOM 96292).

Xylohypha palmicola S.J. Hughes & J. Sugiyama, *N.Z. Jl Bot. 10*: 455-6, 1972
on dead, fallen leaf-sheaths of *Rhopalostylis sapida*, Auckland Province, Swanson, Cascade Kauri Park, 18 Sep 1963, S.J. Hughes (PDD 21519, isotype DAOM 96198b).

Zanclospora brevispora S.J. Hughes & W.B. Kendrick, *N.Z. Jl Bot. 3*: 156, 1965
on bark of *Nothofagus solandri* var. *cliffortioides*, Wellington Province, Tongariro National Park, Whakapapanui Track, 5 Mar 1963, S.J. Hughes (PDD 20647, isotype DAOM 96413-b). Teleomorph = *Chaetosphaeria brevispora* E. Shoemaker.

Zanclospora novae-zelandiae S.J. Hughes & W.B. Kendrick, *N.Z. Jl Bot. 3*: 152, 1965
on dead wood and bark of *Weinmannia racemosa*, Westland, Lake Ianthe, Pukekura, 8 Apr 1963, S.J. Hughes (PDD 20737, isotype DAOM 96020a).

Zebrospora bicolor E.H.C. McKenzie, *Mycotaxon 41*: 189-92, 1991
on dead leaves of *Freycinetia baueriana* ssp. *banksii*, Northland, Omahuta State Forest, Kauri Reserve, 22 Oct 1987, E.H.C. McKenzie (PDD 57681).

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inflata, Uredo
infrequens, Glomus
innata, Neohygrocybe
innexa, Hymenochaete
inornata, Puccinia
inquinata, Russula
invermaius, Glomus
inversus, Marasmius
irregulare, Lophodermium
isolepidis, Schizonella
iti, Rhodocybe
jafneospora, Tarzetta
juncicola, Pseudohelotium
junquillea, Ramariopsis
junquilleo-vertex, Ramaria
kaikawakae, Lophodermium
kaiku, Caeoma
kamahi, Fuscoporia
karaka, Cercospora
karea, Amanita
karetu, Uredo
kauri, Corticium
keae, Puccinia
kinseyi, Puccinia
kirkii, Cordyceps
kirkii, Puccinia
knightiae, Asteridiella
koherika, Puccinia
kopoti, Puccinia
kowhai, Aecidium
kowhai, Nectria
kukutae, Phaeosphaeria
laciniata, Stictis
lanatoniger, Agaricus
lanatulus, Phaeomarasmius
largofulgens, Dermocybe
lasiodermopsis, Nectriopsis
lata, Stictis
latericia, Inocybe
latericolor, Entoloma
lateritia, Cordyceps
laterivecta, Capnobotrys
lauraceus, Coccomyces
leoninum, Thaxterogaster
leontodontis, Synchytrium
leptinellae, Embellisia
leptospermarum, Dermocybe
leptospermi, Astrosporina
leptospermi, Boletus
leptospermi, Corticium
leptospermi, Phomatospora
leptospermi, Seimatosporium
leucopogonis, Vestergrenia
leucospermi, Pestalosphaeria
lianacolum, Corticium
liberatas, Periconiella
libocedri, Coccomyces
lignicola, Nivatogastrium
lignosa, Hymenochaete
lilacinoides, Gliophorus
lilacipes, Gliophorus
limosellae, Synchytrium
lindsayae, Milesia
littorale, Tolyposporium
littoralis, Russula
lividorubra, Mycena
lobatum, Hysterangium
lolii, Acremonium
longipes, Phaeocollybia
longipes, Ramariopsis
longispora, Catenularia
longispora, Codinaea
longwoodicus, Coccomyces
lotivora, Phoma
lutea, Odontia
luteo-aurantiacum, Corticium
luteobulbosa, Inocybe
  var. *volvata*
luteoglutinosus, Gliophorus
luteolum, Thaxterogaster

luteomellea, Simocybe
luteostromata, Xylaria
  var. *macrospora*
luteovirens, Hygrocybe
luteum, Fusicoccum
macnabbianum, Entoloma
macnabbii, Uromyces
macrarenula, Nectria
macrobbii, Xerocomus
macrocystidiata, Russula
macrodontae, Aecidium
macrolopha, Botryosphaeria
macrospora, Catenularia
macrospora, Hypocrea
macrostipitatum, Crocicreas
maculata, Parodiella
magnahypha, Hymenochaete
magnicaulis, Glomus
mahuianum, Lophodermium
maire, Laricifomes
majestatica, Descolea
majuscula, Sphaerella
maleolens, Rhodocybe
mamaku, Mycena
mangatepopense, Lophodermium
mania, Puccinia
manuka, Hypocrea
manuka, Nectria
manuka, Poria
manukanea, Astrosporina
marmoratus, Cortinarius
maruiaensis, Lactarius
masonii, Laccaria
  var. *brevispinosa*
mastigophorus, Ulocoryphus
maurea, Puccinia
medium, Lophodermium
megaspinosa, Clavaria
melanophthalmus, Dasyscyphus
meleagris, Rozites
melimyxa, Cortinarius
melleum, Entoloma
mendica, Inocybe
mesembryanthemi, Albugo
mesosporus, Gymnopilus
metrosideri, Helotium
microlaenae, Cercospora
milleri, Aecidium
miltina, Peziza
mima, Clavaria
miniata, Russula
miniatus, Merulius
minor, Coniophora
minuscula, Hymenochaete
minuta, Phaeocollybia
minutispora, Sebacina
minutoalbum, Entoloma
minutus, Pouzaromyces
monomitica, Duportella
moschata, Puccinia
moschatus, Uredo
multicingulata, Pholiota
multicystidiata, Russula
multiloculata, Nectria
multimatricum, Lophodermium
multiseptata, Nectria
mumura, Amanita
musculo-spinosa, Clavaria
myopori, Aecidium
myriadea, Asteromella
myrsines, Aecidium
namua, Puccinia
nanicus, Crepidotus
napivelatum, Thaxterogaster
naucorioides, Crucispora
nehuta, Amanita
neillii, Sorosporium
nidulans, Chaetoscypha
niger, Elateromyces
nigra, Cyttaria
nigrica, Bovistella
nigricans, Phoma
nigrofactum, Lophodermium
nikau, Epithele
nikau, Lachnella
nikau, Peniophora
nikau, Sebacina
nivale, Thaxterogaster
nivicolor, Polyporus
nobleae, Drechslera
nothepisphaeria, Nectria
nothofagi, Chalara
nothofagi, Fuscoporia
nothofagi, Inonotus
nothofagi, Merulius
nothofagi, Odontia
nothofagi, Paxillus
nothofagi, Phellodon
nothofagi, Poria
nothofagi, Porphyrellus
nothofagi, Pseudostypella
nothofagi, Trabutia
nothofagi, Xerocomus
nothofaginea, Galerina

nothopanacis, Placosoma
novae-zealandiae, Calonectria
novae-zealandiae, Exobasidium
novae-zealandiae, Hypomyces
novae-zealandiae, Meliolina
novae-zealandiae, Odontia
novae-zealandiae, Podonectria
novae-zealandiae, Pseudospiropes
novae-zealandica, Hypocrea
novae-zelandiae, Acrogenospora
novae-zelandiae, Bactrodesmiella
novae-zelandiae, Bactridium
novae-zelandiae, Bipolaris
novae-zelandiae, Boletus
novae-zelandiae, Brachysporium
novae-zelandiae, Capnocybe
novae-zelandiae, Ceratosporella
novae-zelandiae, Chalara
novae-zelandiae, Chaetosphaeria
novae-zelandiae, Cirrosporium
novae-zelandiae, Conoplea
novae-zelandiae, Cordyceps
novae-zelandiae, Dacrymyces
novae-zelandiae, Discosiella
novae-zelandiae, Embellisia
novae-zelandiae, Endophragmiella
novae-zelandiae, Euantennaria
novae-zelandiae, Fusichalara
novaezelandiae, Gautieria
novaezelandiae, Gliocladium
novae-zelandiae, Gliomastix
novae-zelandiae, Gomphus
novae-zelandiae, Guedea
novae-zelandiae, Helminthosporium
novae-zelandiae, Helotium
novae-zelandiae, Lactarius
novae-zelandiae, Melampsora
novae-zelandiae, Menisporopsis
novae-zelandiae, Mesophellia
novae-zelandiae, Phaeostalagmus
novae-zelandiae, Phragmidium
novae-zelandiae, Phylloporus
novaezelandiae, Poria
novae-zelandiae, Porphyrellus
novae-zelandiae, Psilocybe
novae-zelandiae, Puccinia
novae-zelandiae, Russula
novae-zelandiae, Sebacina
novae-zelandiae, Secotium
novaezelandiae, Sphaerostilbella
novae-zelandiae, Trichocladium
novae-zelandiae, Tuburcinia
novae-zelandiae, Uredo
novae-zelandiae, Wrightoporia
novae-zelandiae, Xylohypha
novae-zelandiae, Zanclospora
novo-zealandica, Clavaria
nubilosum, Colletogloeum
obesa, Hymenochaete
obesispora, Codinaea
oblongospora, Odontia
obrusseum, Entoloma
obtectum, Hypoderma
ochracea, Lopharia
ochracea, Ramaria
  var. *sicco-olivacea*
ochraceo-flavus, Aleurodiscus
ohiensis, Laccaria
  var. *paraphysata*
oleariae, Uredo
oleifera, Odontia
oligocystis, Agaricus
olivaceonigra, Dermocybe
olorinatus, Cortinarius
oratiensis, Mycena
oreoboli, Cintractia
oreomyrrhidis, Puccinia
orthospora, Microcera
ostrinus, Gliophorus
otagense, Corticium
otagensis, Pellicularia
otakou, Poria
otakou, Uromyces
otira, Aecidium
oviforma, Perenniporia
pacifica, Capnobotrys
pacifica, Euantennaria
pallida, Cyttaria
pallida, Rozites
pallidus, Gliophorus
pallidus, Glomus
palmicola, Xylohypha
pancaribbea, Ramaria
  var. *zealandica*
papakaiensis, Russula
papakurae, Circinotrichum
papulasporae, Hypomyces
  var. *papulasporae*
paracerasphora, Astrosporina
pareparina, Amanita
parietalis, Crepidotus
parmuliformis, Aleurodiscus
parva, Botryosphaeria
parva, Codinaea

parvispora, Chalara
parvum, Fusicoccum
parvum, Hypohelion
paspali, Phoma
passiflorae, Microdochium
passiflorae, Monographella
patelliformis, Aleurodiscus
patelliformis, Hymenochaete
pateriformis, Aleurodiscus
patinaecolor, Camarophyllus
patricium, Corticium
paucispora, Capnobotrys
paucula, Stictis
pedatissima, Puccinia
pekeoides, Amanita
peltatum, Caeoma
penicillata, Chaetopsina
pentachondrae, Exobasidium
peralbidum, Entoloma
perenne, Corticium
perfluo-punicea, Ramaria
perforans, Endoscypha
perlaevis, Puccinia
perplexum, Entoloma
perroseus, Pluteus
pertusoides, Nectria
perzonatum, Entoloma
petchii, Hypomyces
peziculoides, Aleurodiscus
phaeochlorus, Cortinarius
phaeomarginatum, Entoloma
phaeomyxa, Cuphocybe
phaeospora, Microthyriella
phaeosquarrosa, Inocybe
phaeum, Stereum
phialophora, Chlorovibrissea
phlebophora, Descolea
phlebophora, Simocybe
phoenicea, Clavaria
  var. *persicina*
phormii, Periconiella
phormii, Uredo
phormiicola, Nectria
phyllocladi, Coccomyces
phyllocladi, Trichoscyphella
phymatodeus, Labyrinthomyces
pila, Paurocotylis
pilocystidiata, Russula
pinea, Nectria
pirongia, Poria
pisciodorum, Thaxterogaster
plagianthi, Nectria
plumbeo-argillacea, Clavaria
plurimaesetae, Hymenochaete
plurivora, Phoma
pluteimorphum, Entoloma
pluteoides, Entoloma
podocarpi, Mycena
podocarpi, Xeromphalina
polypogonobia, Puccinia
porphyrescens, Entoloma
porphyreum, Secotium
porphyrophaeus, Cortinarius
pounamu, Puccinia
praestans, Pleuroflammula
pratensis, Camarophyllus
  var. *gracilis*
pratorum, Phoma
probosciophora, Chaetopsis
protrusa, Vararia
pruinata, Simocybe
pruinosa, Sebacina
pseudoareolata, Russula
pseudoflavoviridis, Nectria
pseudomenthae, Puccinia
pseudopanax, Cyphella
pteridicola, Dasyscyphus
pteridicola, Sebacina
pteridophilum, Corticium
puawhananga, Uredo
pudorina, Russula
pulcherrima, Septoria
pulchra, Chalara
pulchriseta, Chaetosphaeria
pulveraceus, Flammulaster
pulverulenta, Nectria
pulvinatum, Acanthophysium
pumatona, Amanita
pumila, Richoniella
purpurata, Dermocybe
purpurea, Bovista
purpurea, Catastoma
purpurea, Clavulina
purpureoniger, Agaricus
purpureopallida, Ramaria
purpureotincta, Russula
pusio, Clavaria
pycnidiophorum, Cryptohymenium
pyriforma, Cyphella
quintiniae, Helotium
radicicola, Nectria
  var. *macroconidialis*
radiciperda, Rosellinia
ramarioides, Ramariopsis

ramuligera, Stictis
  var. *minor*
rancidulum, Entoloma
ranunculi-depressus, Aecidium
ranunculi-insignis, Aecidium
ranunculi-lyallii, Aecidium
ranunculi-monroi, Aecidium
rara, Puccinia
rata, Poria
rattenburyi, Pleurotus
ratticauda, Phaeocollybia
rautahi, Puccinia
rawlingsii, Boletus
rectangulare, Lophodermium
redolens, Octaviania
redoleo-alii, Clavaria
reducta, Macrocystidia
reidiana, Leptosphaeria
reidii, Puccinia
renispora, Inocybe
resupinatum, Steccherinum
rhabarbarinum, Corticium
rhizomorpha, Macrotyphula
rhopalostylidis, Arachnopeziza
rhopalostylidis, Oxydothis
rhytidia, Peziza
rifaii, Peziza
rimosa, Russula
ripogoni, Iodosphaeria
rosella, Hygrocybe
roseopileata, Russula
roseostipitata, Russula
roseo-violacea, Clavaria
rosularis, Polyporus
rosulatus, Polyporus
rotundispora, Ramaria
ruapehu, Nectria
rubescentipes, Entoloma
rubroglobulosa, Mycena
rubromarginatum, Entoloma
rubrum, Lophodermium
rufostipitatus, Xerocomus
rumicicola, Phoma
sacrata, Peniophora
salicorniae, Uredo
samuelsii, Clavulina
samuelsii, Eriopezia
samuelsii, Multiclavula
samuelsii, Ramaria
scabrida, Chalara
scabrida, Pellicularia
scabripes, Xerocomus
scabriuscula, Inocybe
scabrosa, Malacosphaeria
schefflerae, Mycocalicium
schoenus, Cintractia
schoenus, Puccinia
schoenus, Uredo
scillae, Cladosporium
scintillans, Peniophora
scissa, Astrosporina
sclero-carnosa, Ramaria
scobinella, Tomentella
scopinellum, Hydnum
scutellatum, Stereum
segregatus, Hygrophorus
selenosporellae, Oxydothis
sellieriae, Uromyces
separata, Hymenochaete
sepiaceus, Lactarius
septo-cystidiata, Clavulina
setiger, Polyporus
setosa, Monotosporella
  var. *macrospora*
setosa, Apiospora
setosa, Codinaea
sibicola, Nectriopsis
sigmoideum, Hypoderma
simile, Crucibulum
simplex, Codinaea
singulare, Corticium
solitaria, Russula
sordidulum, Entoloma
sordidum, Helotium
sororia, Peniophora
sororicola, Nectriopsis
southlandicus, Uredo
spencerii, Peziza
sphaerospermum, Spadicoides
sphaerospora, Duportella
spiculifer, Irpex
spissa, Mycosphaerella
splendida, Dermocybe
squamiferum, Entoloma
squamulosus, Xerocomus
squarrosa, Neohygrocybe
squarrosus, Paxillus
squarrulosa, Squamanita
sticheri, Hypoderma
stilbocarpae, Ascochyta
stilboidea, Pistillina
stipitata, Chalara
stramenticus, Tyromyces
straminea, Astrosporina

stratosa, Odontia
stratura, Hymenochaete
striatolutea, Hygrocybe
strigosa, Coltricia
strobilomyces, Inocybe
subacerbus, Suillus
subcinnabarinum, Helotium
subclavata, Astrosporina
subiculata, Stictis
subleucophaea, Eichleriella
subrugosa, Clavulina
  var. *tenuis*
subscopinella, Odontia
subsimile, Phragmidium
subsordida, Clavaria
subvinosa, Russula
subviolacea, Clavaria
sulcatum, Nivatogastrium
sulphureum, Entoloma
superbum, Secotium
tabacina, Simocybe
tabacinum, Hydnum
taiepa, Amanita
tararua, Puccinia
tawa, Hypocrea
tawa, Nectria
tawa, Sebacina
tawa, Trametes
tawa, Tremella
tawai, Lactarius
tawai, Russula
tawhai, Fuscoporia
taylorianus, Cortinarius
tekapo, Puccinia
tenuis, Rhizophagus
tessellata, Odontia
testacea, Xeromphalina
tetragoniae, Puccinia
  var. *novae-zelandiae*
theissenii, Xylaria
  var. *macrospora*
thermometra, Peniophora
tindalii, Lophodermium
tintinnabula, Apiospora
tiritea, Puccinia
toa, Puccinia
toatoa, Tyromyces
toetoe, Uredo
tongariro, Cyphella
toro, Hypocrea
torquatum, Corticium
tortilis, Stictis
tortuosa, Conoplea
tortuosa, Ramariopsis
torulispora, Patellaria
totara, Cyphella
totara, Peniophora
totara, Poria
totarae, Auricula
translucidum, Entoloma
transpusio, Tremellodendropsis
  var. *inflata*
  var. *minor*
traversiae, Aecidium
tricholomopsis, Russula
trichosurus, Coprotus
trinervia, Stictis
tripartita, Endophragmiella
triseptata, Antennatula
triseptatus, Dasyscyphus
tristificum, Entoloma
tuberculata, Trichosphaerella
tuberculospora, Clavaria
tunicatum, Hysterangium
tupare, Uredo
turbinata, Cyphella
uligincola, Entoloma
umbonatum, Corticium
umbracula, Peniophora
umbrosa, Inocybe
umerensis, Lactarius
umerensis, Russula
uncatus, Fomes
uncinata, Menispora
unciniae, Lophodermium
unica, Simocybe
unicolor, Chalara
urnigerobasidiata, Clavulina
utriculicum, Corticium
utriculosa, Peniophora
vaginata, Hymenochaete
vallata, Hymenochaete
vallum, Corticium
variicolor, Corticium
verecunda, Peniophora
verrucipes, Phaeomarasmius
verrucosa, Dingleya
verrucosa, Disciseda
verruculosa, Odontia
versicolor, Gliophorus
vesiculosa, Odontia
vesiculosa, Peniophora
vesiculosa, Tremella
villosa, Capronia

vinaceipora, Mycena
vinaceo-cervina, Clavulina
  var. *avellanea*
vinaceocuticulata, Russula
vinicolor, Dermocybe
violaceovolvatum, Thaxterogaster
viride, Corticium
viriditinctum, Pyrrhoglossum
viridopurpurascens, Agaricus
viscata, Astrosporina
viscaurantius, Gliophorus
viscidus, Porphyrellus
  var. *macrosporus*
viscostriatus, Cortinarius
viscoviridis, Cortinarius
vitellinum, Corticium
vitreopileatus, Cortinarius
vivida, Russula
vorax, Melanotus
vulgaris, Codinaea
vulsum, Entoloma
wahlenbergiae, Puccinia
waikanaensis, Phaeosphaeria
waiouru, Cintractia
waipoua, Uromyces
wellingtonensis, Xylaria
wellingtonii, Hydnum
weraroensis, Poria
westlandica, Nectria
westlandicum, Aecidium
whakatipu, Puccinia
wharanui, Uredo
ypsilonidia, Clavaria
zealandica, Pellicularia
zelandicum, Bivallum

ADDENDUM

Unfortunately, seven *Chalara* species were omitted from this list. They are:

Chalara agathidis T.R. Nag Raj & Kendrick, A Monograph of Chalara and Allied Genera: 81, 1975
  dead leaf of *Agathis australis*, Auckland, Waitakere Ra., Piha Valley, Ricker Tr., 9 Feb 1974, W.B. Kendrick (PDD 32868).

Chalara angionacea T.R. Nag Raj & Kendrick, A Monograph of Chalara and Allied Genera: 85-7, 1975
  dead leaf of *Knightia excelsa*, Manukau Co., Orere Pt., 3 Jan 1974, W.B. Kendrick (PDD 32870).

Chalara curvata T.R. Nag Raj & Kendrick, A Monograph of Chalara and Allied Genera: 105, 1975
  leaf of *Dracophyllum traversii*, Arthur's Pass Nat. Pk., Scott's Tr., 27 Apr 1974, W.B. Kendrick (PDD 32642).

Chalara gracilis T.R. Nag Raj & Kendrick, A Monograph of Chalara and Allied Genera: 120-1, 1975
  dead leaves of *Knightia excelsa*, Auckland, Waitakere Ra., Fairy Falls Tr., 14 Jan 1974, W.B. Kendrick (PDD 32872).

Chalara inaequalis T.R. Nag Raj & Kendrick, A Monograph of Chalara and Allied Genera: 122, 1975
  dead leaves of *Nothofagus menziesii*, Rd. to Milford Sound, 1mi. N. of Tunnel, 14 Apr 1974, W.B. Kendrick (PDD 32643).

Chalara sessilis T.R. Nag Raj & Kendrick, A Monograph of Chalara and Allied Genera: 134-5, 1975
  dead leaves of *Knightia excelsa*, Auckland, Northcote, Kauri Glen Pk., 19 Feb 1974, W.B. Kendrick (PDD 32639).

Chalara tubifera T.R. Nag Raj & Kendrick, A Monograph of Chalara and Allied Genera: 137-8, 1975
  dead leaves of *Knightia excelsa*, Hongi's Tr. Scenic Reserve, 12 Jan 1974, W.B. Kendrick (PDD 32871).

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ADDITIONS TO THE AQUATIC HYPHOMYCETES OF TIERRA DEL FUEGO ARGENTINA.

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Nacional de La Plata. Av. 53 # 477, 1900, La Plata,
Argentina.

1._ SUMMARY

Twenty species of aquatic Hyphomycetes are reported as additions to the known aquatic Hyphomycetes of Tierra del Fuego. Argentina, viz. *Alatospora acuminata* Ingold, *Ceratosporium fuscescens* Schweinitz, *Clavatospora longibrachiata* (Ingold) Nils ex Marv. & Nils., *Condylospora spumigera* Nawawi, *Flagellospora curvula* Ingold, *Fontanospora eccentrica* (Petersen) Dyko, *Geniculospora intermedia* (Petersen) S. Nilsson ex Marvanová & S. Nilsson, *Gyoerffyella gemellipara* Marvanová, *Heliscus lugdunensis* Sacc. & Terry, *Isthmolongispora geniculata* Nawawi & Kuthubutheen, *Tetrabrachium elegans* Nawawi & Kuthubutheen, *Tetrachaetum elegans* Ingold, *Tricladium splendens* Ingold, *Tricladiomyces geniculatus* Nawawi & Kuthubutheen, *Triscelophorus monosporus* Ingold, *Tricellula aquatica* Webster, *Trisulcosporium acerinum* Hudson & Sutton, *Varicosporium delicatum* Iqbal and *Varicosporium elodea* Kegel. Information is provided concerning the habitat and distribution of the species. Seventeen genera and nineteen species are new records for Argentina.

2.- INTRODUCTION

The mycoflora of aquatic habitats includes hyphomycetes. They growth on submerged leaves, twigs and wood in well aereated waters.

After Ingold (1942), who reconized these aquatic Hyphomycetes, many of them have been collected on foam, scum and different classes of submerged litter, from all over the world (Crane, 1968; Dyko, 1978; Gonczol, 1976; Hudson et al 1960; Iqbal & Webster, 1973; Iqbal & Webster, 1977; Matsushima, 1971; Nawawi, 1973 abc; Nilsson, 1962, 1964;
Nolan, 1972; Petersen, 1962, 1963 ab; Stati & Tuwari, 1990; Singh, 1976; Wolf, 1976).

Only one paper has been published known about aquatic Hyphomycetes from Tierra del Fuego (Godeas, 1985). After two collecting trips, the authors increased the records of distribution of these fungi, occurring in the rapidly flowing freswater stream in the temperate *Nothofagus* forest of the Tierra del Fuego

3.- MATERIALS AND METHODS

Sample of brown decaying submerged leaf of different species of *Nothofagus* and grasses, foam, scum, and wood were collected from Tierra del Fuego and brought to the laboratory in separate sterile polyethylene bags.

Samples of foams were collected in sterile bottles and fixed with 5% F.A.A.

Leaves were washed under running tap water and placed in bubbling water for incubation at 13-15 C.

4.- RESULTS

Nineteen different species were found and their distribution and source are shown in Table 1

The specie most frecuently found was *Clavatospora longibrachiata*, present in leaves of *Nothofagus pumilio* and gramineae submerged in rivers where water temperature was 3-5 C.

In decreasing order of importance were found *Alatospora acuminata*, *Tetrabrachium elegans* and *Tetracladium setigerum*, the remaining species only occurred occasionally. The richest substrate was leaves of *Nothofagus pumilio* that were colonized for the most of the species founded.

TABLE 1

SPECIES	SOURCE	DISTRIBUTION
Alatospora acuminata Ingold, 1942	DHL-DTL	Paso Garibaldi, Ruta O, Piedra Barco, Laguna Victoria.
Ceratosporium fuscescens Schweinitz, 1832	DW	Río Turbio
Clavatospora longibrachiata (Ingold) Nils. ex Marv.& Nils.,1971.	GL-DTL	Paso Garibaldi, Ruta O.
Condylospora spumigera Nawawi, 1976	F-DHL	Paso Garibaldi,
Flagellospora curvula Ingold, 1942	GL-DTL	Tierra Mayor, Paso Garibaldi
Fontanospora eccentrica (Petersen) Dyko, 1978	DTL	Paso Garibaldi
Geniculospora intermedia (Petersen) Dyko, 1978	DTL	Estancia Moat, Paso Garibaldi
Gyoerffyella gemellipara Marvanová, 1975	DTL	Estancia Harberton, Arroyo Las Cotorras
Heliscus lugdunensis Sacc & Terry, 1880	F	Estancia Moat
Isthmolongispora geniculata Nawawi & Kuthubutheen, 1988	DTL	Laguna Victoria
Tetrabrachium elegans Nawawi & Kuthubutheen, 1988	DTL	Paso Garibaldi Laguna Victoria
Tetrachaetum elegans	M-F	Paso Garibaldi
Tricellula aquatica Webster, 1959	DTL	Laguna Victoria
Tricladium splendens Ingold, 1942	DTL	Laguna Victoria
Tricladiomyces geniculatus Nawawi & Kuthubutheen, 1985	DTL	Estancia Moat
Triscelophorus monosporus Ingold, 1943	GL-DTL	Paso Garibaldi Río Milna
Trisulcosporium acerinum Hudson & Sutton, 1964	DTL	Paso Garibaldi
Varicosporum delicatum Igbal, 1971	F-DTL	Paso Garibaldi
Varicosporium elodea Kegel, 1906	GL	Paso Garibaldi

D: Dicots; G: Graminae; L: leaves; F: foam; H: herbaceous; T: tree; M: Musci; W: wood.

5. - REFERENCES

Crane, J.L., 1968. Freshwater hyphomycetes of the northern Appalachian highland including New England and three castal plain states. *Am. J. Bot.* 55:996-1002.

Dyko, B. J., 1978. New aquatic and waterborne hyphomycetes om the southern Appalachian mountains in the United States. *Trans. Brit. Mycol. Soc.* 70:409-417.

Godeas, A.M., 1985. Hifomicetes (Deuteromycotina) acuatícos de Tierra del Fuego I. *Physis* 43:7-9.

Gonczol, J., 1976. Ecological observations on the aquatic hyphomycetes of Hungary. II. Observations on biotopes of aquatic hyphomycetes in southwest Hungary. *Acta Bot. Acad. Sci. Hung.* 22:51-60.

Greathead, S.K., 1961. Some aquatic hyphomycetes in South Africa. *J. S. Afr. Bot.* 27:195-228.

Hudson, H. J. & C. T. Ingold, 1960. Aquatic hyphomycetes from Jamaica. *Trans. Brit. Mycol. Soc.* 43:469-78.

Ingold, C.T., 1942. Aquatic Hyphomycetes of decaying alder leaves. *Trans. Brit. Mycol. Soc.* 25:339-417.

Iqbal, S. H. & J. Webster, 1973. Aquatic spora of the River Exe and its tributaries *Trans. Brit. Mycol. Soc.* 61:331-346.

Iqbal, S. H. & J. Webster, 1977. Aquatic hyphomycetes spora of some Darmoor streams. *Trans. Brit. Mycol.Soc.* 69:233-241.

Marvanová, L. & F. Barlocher, 1989. Hyphomycetes from Canadian streams II. Three new taxa. *Mycotaxon* 35:85-99.

Matsushima, T., 1971. Mycological reports from New Guinea and the Solomon Island. 7. Some interesting Fungi Imperfecti. *Bull. Natl. Sci. Mus., Tokyo* 14:460-480.

Nawawi, A., 1973a. *Clavatospora filiformis* sp. nov., an aquatic hyphomycetes from Malaysia. *Trans. Brit. Mycol. Soc.* 61:390-392.

Nawawi, A., 1973b. Two clamp-bearing aquatic fungi from

Malaysia. *Trans. Brit. Mycol. Soc.* 61:521-528.

Nawawi, A., 1973c. A new species of Flabellospora from Malaysa. *Malais. J. Sci.* 2:55-58.

Nilsson, S., 1962. Some aquatic hyphomycetes from South America. *Svensk. Bot. Tidskr.* 56: 351-361.

Nilsson, S. 1964. Freshwater hyphomycetes: Taxonomy, morphology and ecology. *Symb. Bot. Ups.* 18:1-130.

Nolan, R. A., 1972. The aquatic hyphomycete: *Geniculospora inflata* from Labrador. *Mycologia* 64:1169-1174.

Petersen, R. H., 1962. Aquatic hyphomycetes fron North America I. Aleuriosporae (part 1), and key to the genera. *Mycologia* 54:117-151.

Petersen, R. H., 1963a. Aquatic hyphomycetes from North America II. Aleuriosporae (part 2) and Blastosporae. *Mycologia* 55:18-29.

Petersen, R. H., 1963b. Aquatic hyphomycetes from North America III. Phialosporae and miscelaneous species. *Mycologia* 55:570-581.

Sati, S. C. & N. Tuwari, 1990. Some aquatic Hyphomycetes of Kumaun, India. *Mycotaxon* 39:407-414.

Singh, N., 1976. *Pyramidospora herculiformis* sp. nov., a new aquatic hyphomycete from Sierra Leone. *Trans. Brit. Mycol. Soc.* 66:347-350.

Wolfe, C. C., 1976. Distributional history of the biota of the southern Appalachians. IV. (Algae and Fungi). Aquatic hyphomycetes of southern Appalachians. *Bull. Water. Resour. Res. Cent., Va. Polytech. Inst. State Univ.* 243-26

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STUDIES IN THE GENUS CLADOSPORIUM SENSU LATO. VII. CONCERNING CLADOSPORIUM CUCUMERINUM, CAUSAL ORGANISM OF CROWN BLIGHT AND SCAB OR GUMMOSIS OF CUCURBITS

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ABSTRACT

Cladosporium cucumerinum Ell. & Arth., is described and illustrated. Comments are made on characteristics distinguishing it from anamorphs of similar morphology, including *C. cladosporioides* and *C. vignae*.

INTRODUCTION

The anamorph fungus *Cladosporium cucumerinum*, the causal organism of crown blight and scab or gummosis disease of foliage and fruit of *Citrullus lanatus* (Thunb.) Matsum. & Nakai (water melon), *Cucumis sativus* L. (cucumber), *Cucumis melo* L. (melon), and *Cucurbita pepo* L. (marrow, squash), is widespread in Europe and North and Central America (Farr *et al.* 1989; Holliday 1980; Ellis and Holliday, 1972). In the United States, it has been reported to occur on *C. melo* in a number of states, including North and South Carolina and Texas (Grand, 1985; Winstead *et al.*, 1959; Sleeth, 1958) and on *C. sativus* in Florida, North Carolina, Oklahoma, Oregon and Washington (Grand, loc. cit.; Alfieri *et al.*, 1984; Shaw, 1973; Gabrielson, 1964; Winstead *et al.*, 1960; Preston, 1945). Records from many parts of the country have been made on *C. pepo* (see Anon., 1960). It has also been isolated in Georgia from achenes of *Helianthus annus* L. [sunflower] (Roberts *et al.*, 1986), together with other species of *Cladosporium* including *C. cladosporioides* (Fres.) de Vries, *C. herbarum* (Pers.) Link, *C. oxysporum* Berk. & Curt. and *C. sphaerospermum*

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Penz. *Cladosporium cladosporioides* and *C. cucumerinum* were isolated from 2% and 1% respectively of over 28,000 oil-type and confectionary sunflower seeds plated on agar media, a significant number. The two taxa were among the dominant fungi encountered based on isolation percentages. Since *C. cucumerinum* has generally been considered to be host-specific and confined to members of the Cucurbitaceae, its occurrence on *Helianthus* is unusual.

Symptoms of infection on immature fruit take the form of pronounced, sunken, brownish lesions with gummy exudate. On older fruit, brown scabs are produced, while on leaves, necrotic, water-soaked spots, sometimes also with gummy exudate, are formed (Holliday, loc. cit.). Young seedlings may be seriously damaged and, under certain conditions of temperature and humidity, dieback of apical shoots occurs (de Vries, 1952; Holliday, loc. cit.). In nature, conidiation on leaves tends to be sparse, a similar situation to that seen in some other pathogenic species of *Cladosporium* that cause leaf spots, such as *C. chlorocephalum* (Fres.) Mason & M.B. Ellis [= *C. paeoniae* Passerini] (see McKemy and Morgan-Jones, 1991).

Cladosporium cucumerinum has been described under a number of different names [see nomenclator in the taxonomic part below]. In addition to those listed, de Vries (1952) included *Chloridium polysporum* (Wallr.) Sacc. (*Syll. Fung.* 4: 323, 1886) [= *Acladium polysporum* Wallr., *Fl. crypt. Germ.* 2: 287, 1833] as a synonym, pointing out that this predated *C. cucumerinum*. Since *C. cucumerinum* had been a name in common use for over half a century, de Vries (loc. cit.) chose not to take up the epithet '*polysporum*' as would be mandated by date priority according to the International Code of Botanical Nomenclature. This was fortunate since the two are not conspecific and do not even belong to the same genus. It is unclear why de Vries considered the two to be the same fungus other than, perhaps, the fact that *A. polysporum* had been described from a decaying cucurbit in Thuringia (Wallroth, 1833). Hughes (1958) listed *A. polysporum* as a synonym of *Botrytis cinerea* Pers., following examination of material in Wallroth's herbarium at Strasbourg (STR).

Together with such species as *C. cladosporioides*, *C. piscicolum* Snyder, *C. sphaerospermum*, and *C. vignae* (see Morgan-Jones and McKemy, 1992), *C. cucumerinum* belongs to a complex of species having broadly similar conidiophore and conidium morphology. They all produce long, cylindrical, frequently one or two-septate ramo-conidia, and ellipsoidal to broadly fusiform or somewhat limoniform intercalary conidia. *Cladosporium sphaerospermum* is distinct in having mostly subglobose to globose, verruculose, terminal conidia [see de Vries, 1952; Ellis, 1971], although transitional forms between it and *C. cladosporioides* have been reported (de Vries, 1952; Domsch *et al.*, 1980). *Cladosporium cucumerinum* and, as indicated in a preceding publication in this series (Morgan-Jones and McKemy, loc. cit.), *C. vignae* are considered to be distinct from *C. cladosporioides*, but the status of *C. piscicolum* needs reconsideration following comparative studies *in vitro*. De Vries (1952) classified this species as a *forma specialis* of *C. cladosporioides* [*C. cladosporioides* f. sp. *piscicolum* (Snyder) de Vries]. Although *formae speciales* are not controlled by the International Code of Botanical Nomenclature, such author citations have become common practice and this taxonomic rank is used to designate entities which differ from each other

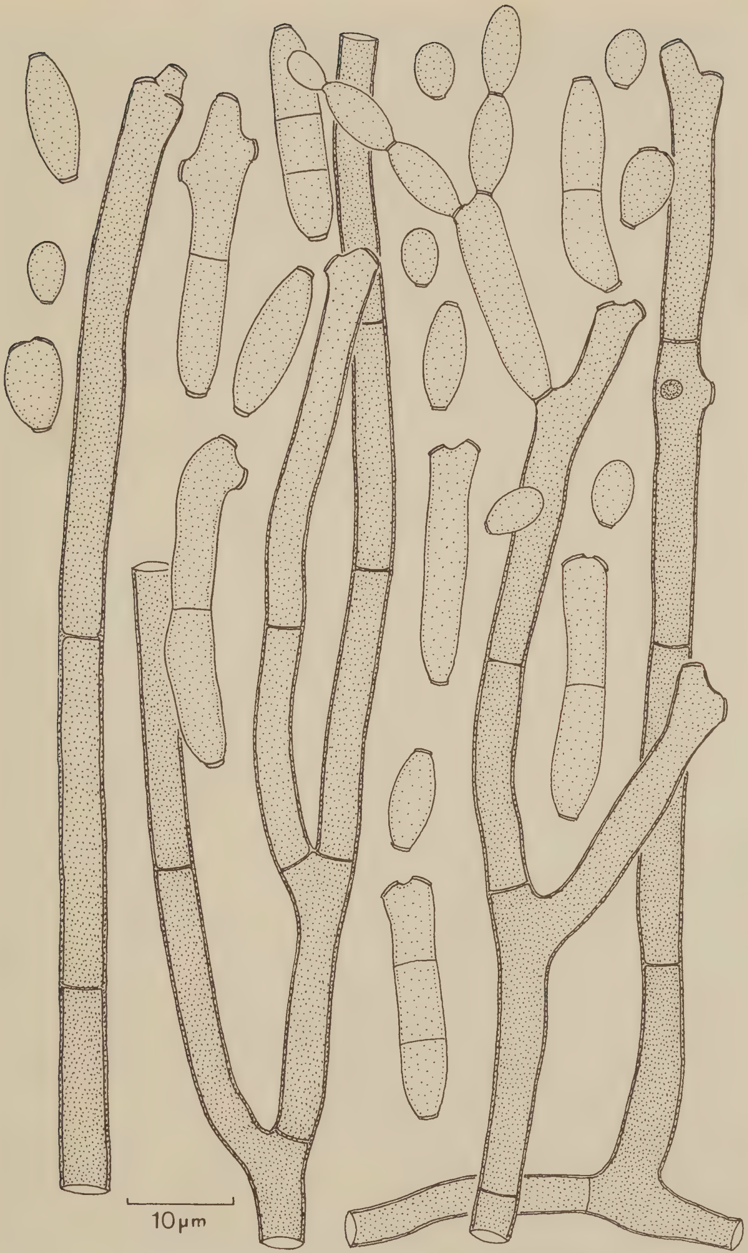


FIGURE 1. *Cladosporium cucumerinum in vitro.* Conidiophores and conidia.

predominantly by physiological adaptation (Hawksworth, 1974). *Cladosporium cucumerinum*, *C. piscicolum* and *C. vignae* differ from *C. cladosporioides* and *C. sphaerospermum*, both of which are considered to be saprotrophic and secondary invaders of diseased plant tissue, in being pathogenic to their respective hosts; cucurbits, English pea and cowpea.

We have had opportunity to study *C. cucumerinum* and, as part of our ongoing project to provide comprehensive, modern descriptions of *Cladosporium* species, it is treated herein.

TAXONOMIC PART

Cladosporium cucumerinum Ellis & Arth., *Bull. agr. Exp. Stn. Indiana* 19: 9, 1889 (Plate 1, Figure 1).

= *Scolecotrichum melophthorum* Prill. & Delacr., *Bull. Soc. Mycol. Fr.* 8: 219, 1891.

≡ *Macrosporium melophthorum* (Prill. & Delacr.) Rostrup, *Gardner Tidende*: 189, 1893.

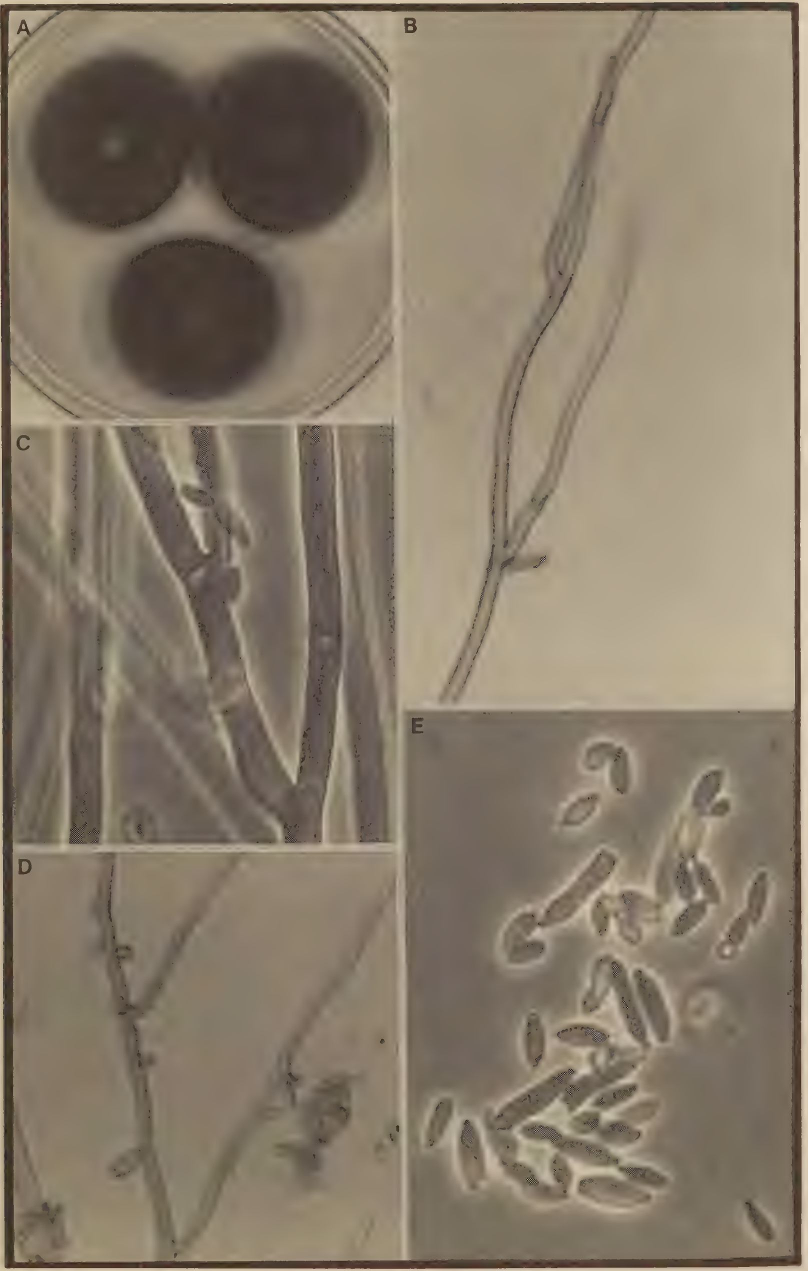
= *Cladosporium cucumeris* Frank, *Z. Pflanzenkr.* 3 : 30, 1893.

= *Macrosporium cucumerinum* Ell. & Everh., *Hedwigia* 7: 49, 1896.

= *Cladosporium scabies* Cooke, *Gard. Chron.*, Ser. 3, 34: 100, 1903.

Colonies in nature effuse, greyish olive, velvety to somewhat felted with age. Mycelium partly immersed in the substratum, partly superficial on fruit, composed of subhyaline to pale brown, smooth, branched, 2-3 µm wide hyphae. Immersed hyphae often with a slime coat, sometimes becoming spirally twisted. Colonies on potato dextrose agar (PDA) [Difco] grown at 25C attaining a diameter of 14 mm and 21 mm after 7 and 14 days, respectively, more or less evenly velvety, variously sulcate, particularly toward the colony margin, with mostly straight furrows extending a short distance inwards, giving the peripheral portion an undulate aspect, center sometimes very slightly umbonate, generally evenly colored, but with coloration varying and changing with age and increased conidiation, from Greenish Grey/Dull Green [30E2/30E3] to Olive Brown [4E4] and finally Olive [1F3/2F3] (Kornerup and Wanscher, 1978), margin even or very slightly lobed, bordered by a 1-2 mm wide, Pale Grey [1B1] to Yellowish Grey [3B2] zone. Colony reverse Bronze Green [30F3] centrally to Pale Grey [1B1] peripherally. Colonies on PDA at 20C and 30C attaining a diameter of 19 mm and 14 mm, respectively, after 14 days; appearance and coloration at 20C and 30C generally similar to those at 25C. Conidiophores in nature semimacronematous to macronematous, mononematous, erect, straight,

PLATE 1. *Cladosporium cucumerinum*. A, 14-day-old colonies on PDA at 25C; B-D, conidiophores from culture on PDA showing characteristic branching patterns; E, conidia.


A
B
C
D
E

somewhat flexuous, cylindrical, septate, smooth, thick-walled, pale to mid brown, sympodial, simple or rarely branched, usually bearing a number of ramo-conidia apically or subapically, up to 350 µm long, 4-6 µm wide, often swollen, bulbous, and up to 8 µm wide at the base, arising from inflated hyphal cells. Conidiophores in culture arising terminally and laterally, pale brown, frequently branched, with branches often arising unilaterally, immediately below transverse septa. Conidiogenous cells holoblastic, polyblastic, integrated, terminal or sometimes intercalary; where terminal, indeterminate, sympodial, bearing a number of flat, prominent, thickened scars, 1-2 µm in diameter. Conidia catenate, in long branched chains. Ramo-conidia cylindrical to clavate or occasionally somewhat ampulliform to doliiform, straight or slightly curved, smooth, pale brown, 0-3 septate, mostly 0-1 septate, bearing two to four flat thickened scars, up to 35 (6-20) µm long, 4-6 µm wide, with one or more scars often lying sideways in a subterminal position. Intercalary conidia ellipsoidal, or broadly fusiform to limoniform, pale brown, smooth, 0-1 septate, up to 25 µm long, 4-6 µm wide. Terminal conidia subglobose to ellipsoidal, non-septate, 3-5 X 2-3.5 µm.

On leaves, stems and fruits of Cucurbitaceae; cosmopolitan.

Collections examined: on *Cucumis sativus*, Salisbury, Southern Rhodesia [now Harare, Zimbabwe], A. Rothwell, June 4, 1956, IMI 63231; on *C. sativus*, Institute of Horticultural Research, Wellesbourne, Warwick, United Kingdom, R.B. Maude, October 31, 1988, IMI 328347; isol. ex *C. sativus*, Department of Horticulture, University of Wisconsin, Madison, U.S.A., M.J. Havey, 1990, AUA.

DISCUSSION

In his studies on *Cladosporium*, de Vries (1952) listed a number of features found useful in distinguishing *C. cucumerinum* from *C. cladosporioides*, a species that he considered very similar. He stated that it was paler in color than the latter, a fact also noted by Pfaltzer (1927), and to have wider conidia. He also regarded its pathogenicity, and the characteristic disease symptoms that it produced, an important distinction. In addition, formation of a transparent, yellowish-brown zone around colonies of *C. cucumerinum* when grown on gallic acid-malt agar was found to contrast with a dark brown zone formed around those of *C. cladosporioides*.

Although, at first glance, it is often quite difficult to confidently and clearly distinguish morphologically some of the species of this complex, more detailed observation frequently yields additional hallmark characteristics. Conidiophore morphology and colony appearance, coloration and growth rates, are among the most useful. In the case of *C. cucumerinum*, apart from its host relationships, a number of features fall into this category. Interestingly, the thickness and width of its conidial scars seem diagnostic. The scars in this species are flat and appreciably wider than is usual in the genus *Cladosporium*. There is very little, if any, swelling associated with conidiogenesis at the fertile apex of the conidiophore. Usually, only two or three ramo-conidia are formed in close proximity to one another toward the tip, with little sympodial proliferation. Because of the width of the conidial scar, the conidiophore apex tends to be distinctly truncate, with only a few conidiogenous loci produced.

Scars of the first formed ramo-conidium often come to lie sideways, vertically, parallel to the periclinal conidiophore wall, or conidial scars may remain horizontal and appear as steps just below the extreme conidiogenous cell apex. Following initial conidiogenesis, during which one, two, or more rarely, three ramo-conidia and chains of intercalary conidia are formed, the conidiophore may proliferate sympodially and extend some distance before conidiogenesis recurs at a higher level. During this process, a transverse septum is often laid down just above the area of primary conidiation, resulting in the initial conidiogenous cell becoming intercalary. Conidial scars similar in width to those borne on conidiogenous cells occur on ramo-conidia and one or more of those formed toward their apex become displaced sideways and lie parallel to the conidial wall.

Another feature of *C. cucumerinum* conidiophores is that, *in vitro*, they are often branched [Plate 1, B-D]. Branches originate immediately below transverse septa. In this regard, *C. cucumerinum* resembles *C. uredinicola* (see Morgan-Jones and McKemy, 1990). Prasil and de Hoog (1988) reported occasionally di- and trichotomously branched, terminally-borne conidiophores in *C. herbarum*. Whether or not conidiophores of many *Cladosporium* species tend to branch when grown in culture on agar media remains to be determined. When *C. cucumerinum* is compared in this regard with *C. vignae* (see Morgan-Jones and McKemy, 1992), a morphologically similar species and a pathogen of certain Fabaceae, however, they are clearly different since the latter forms unbranched conidiophores *in vitro*. In colony appearance, particularly coloration, and in growth rates, the two are also easily distinguishable, as is *C. cladosporioides*. As noted previously (Morgan-Jones and McKemy, 1992), species of *Cladosporium* that are pathogens generally grow appreciably slower in culture than do those that are saprotrophic in nature.

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LITERATURE CITED

ALFIERI, S.A. JR., K.R. LANGDON, C. WEHLBURG, and J.W. KIMBROUGH. 1984. Index of Plant Diseases in Florida. *Fl. Dept. Agric. and Consumer Ser., Div. Pl. Ind. Bull.* No. 11 (Revised). 389 pp.

ANON. 1960. Index of Plant Diseases in the United States. USDA Agr. Hbk No. 165. Washington, D.C., 531 pp.

DE VRIES, G.A. 1952. Contribution to the knowledge of the genus *Cladosporium* Link ex Fr. Diss. Univ. Utrecht, 121 pp.

DOMSCH, K.H., W. GAMS and T.H. ANDERSON. 1980. Compendium of Soil Fungi. Vol. 1. Academic Press, 859 pp.

ELLIS, M.B. 1971. Dematiaceous Hyphomycetes. Commonw. Mycol. Inst., 608 pp.

ELLIS, M.B. and P. HOLLIDAY. 1972. *Cladosporium cucumerinum. CMI desc. Path. Fung. Bact.* No. 348. Commonwealth Mycological Institute, Kew.

FARR, D.F., G.F. BILLS, G.P. CHAMURIS and A.Y. ROSSMAN. 1989. Fungi on Plants and Plant Products in the United States. 1st Ed. APS Press, 1252 pp.

GABRIELSON, R.L. 1964. Cucumber scab in western Washington. *Pl. Dis. Reptr.* 48: 801-802.

GRAND, L.F. 1985. North Carolina Plant Disease Index. *N.C. Agric. Res. Serv. Tech. Bull.* 240: 1-157.

HAWKSWORTH, D.L. 1974. Mycologist's Handbook. Commonw. Mycol. Inst. 231 pp.

HOLLIDAY, P. 1980. Fungus Diseases of Tropical Crops. Cambridge University Press. 607 pp.

HUGHES, S.J. 1958. Revisiones hyphomycetum aliquot cum appendice de nominibus rejiciendis. *Can. J. Bot.* 36: 727-836.

KORNERUP, A. and J.H. WANSCHER. 1978. Methuen Handbook of Colour. 3rd Ed. Hastings House, New York, 252 pp.

MCKEMY, J.M. and G. MORGAN-JONES. 1991. Studies in the genus *Cladosporium sensu lato.* III. Concerning *Cladosporium chlorocephalum* and its synonym *Cladosporium paeoniae*, the causal organism of leaf-blotch of peony. *Mycotaxon* 41: 135-146.

MORGAN-JONES, G. and J.M. MCKEMY. 1990. Studies in the genus *Cladosporium sensu lato.* I. Concerning *Cladosporium uredinicola*, occurring on telial columns of *Cronartium quercuum* and other rusts. *Mycotaxon* 39: 185-202.

MORGAN-JONES, G. and J.M. MCKEMY. 1992. Studies in the genus *Cladosporium sensu lato.* VI. Concerning *Cladosporium vignae*, causal organism of leaf and pod spot of cowpea (*Vigna unguiculata*) and leaf blight of *Lespedeza bicolor. Mycotaxon* 43: 9-20.

PFALTZER, A. 1927. Het vrucht- en bladvuur van de komkommer. Thesis. Rijksuniversiteit Utrecht, Baarn, The Netherlands.

PRASIL, K. and DE HOOG, G.S. 1988. Variability in *Cladosporium herbarum. Trans. Br. mycol. Soc.* 90(1): 49-54.

PRESTON, D.A. 1945. Host Index of Oklahoma Plant Diseases. *Ok. Agric. Mech. Coll. Agric. Exp. Stn. Tech. Bull.* (suppl.) T-21: 1-39.

ROBERTS, R.G., J.A. ROBERTSON and R.T. HANLIN. 1986. Fungi occurring in the achenes of sunflower (*Helianthus annus*). *Can. J. Bot.* 64: 1964-1971.

SHAW, C. G. 1973. Host Fungus Index for the Pacific Northwest - I. Hosts. *Wash. St. Agric. Exp. Sta. Bull.* 765: 1-121.

SLEETH, B. 1958. *Cladosporium* in melons in south Texas. *Pl. Dis. Reptr.* 42: 1104.

WALLROTH, C.F.W. 1833. *Flora cryptogamica Germaniae*. Nurnberg.

WINSTEAD, N.N., D.L. STRIDER and S.F. JENKINS. 1959. Scab disease on cantaloupes in North Carolina. *Pl. Dis. Reptr.* 43: 424.

WINSTEAD, N.N., D.L. STRIDER and L.H. PERSON. 1960. Vegetable diseases in North Carolina during 1958 and 1959. *Pl. Dis. Reptr.* 44: 491-495.

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A COLLECTION OF *PEZIZA NIVALIS* FROM CALIFORNIA WITH COMMENTS ON THE NOMENCLATURE OF THE SNOW BANK PEZIZAS

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ABSTRACT

The name *Peziza nivalis* is used for a species of *Peziza* collected on soil at the margins of melting snow in the Sierra Nevada of California. The species is described and extensive comments are made on the nomenclature of this and related species. A new species, *Peziza heimii*, is proposed to accommodate a species similar to *P. nivalis* but with larger ascospores.

INTRODUCTION

In this paper a species of *Peziza* found on soil at the margin of melting snow in the Sierra Nevada in California is described. The name *Peziza nivalis* has been used for it but there is considerable confusion over the proper application of this and other names for *Peziza* species associated with melting snow. None of the several taxa described from this ecologically distinct group of Pezizas has been completely or adequately studied. The synonyms listed below provide a nomenclatural guide for the application of the name but a great deal remains to be determined regarding the biology and distribution of these species.

PEZIZA NIVALIS AND ITS SYNONYMS

Peziza nivalis (Heim & Remy) Moser apud Avizohar-Hershenzon & Nemlich, Israel J. Bot. 23: 157. 1974.
≡ *Galactinia nivalis* Heim & Remy, Bull. Soc. Mycol. France 48: 63. 1932.
≡ *Aleuria nivalis* (Heim & Remy) Heim, Rev. Mycol. 12:71. 1947 *non Aleuria nivalis* Heim & Remy 1932, *nom. nud.*
[≡ *Peziza flos-nivium* Donadini, Bull. Soc. Linn. Provence 30: 80. 1977, superfluous]
= *Peziza ninguis* Donadini & Trimbach, Bull. Soc. Linn. Provence 30: 7. 1977; Doc. Mycol. 9(36): 29. 1979.
= *Peziza fortoulii* Donadini & Neville, Bull. Soc. Linn. Provence 30: 83. 1977; Doc. Mycol. 9(36): 29. 1979.
≡ *Peziza ninguis* var. *fortoulii* (Donadini & Neville) Donadini, Bull. Soc. Linn. Provence 31: 12. 1978.
= *Peziza phaeotheca* McKnight & Dublin, Sydowia Beiheft 8: 224. 1979.

Apothecia solitary, dark brown with purplish tints, plane, about 1 cm in diam, neither staining when bruised nor producing a colored juice when cut. Fragile, drying to a thin crust. Hymenium in most specimens pock-marked or warted. Excipulum and hymenium, in section, yellow-brownish. Excipulum composed of globose cells with occasional interwoven hyphae; toward the outside the cells range up to 45 μm, sometimes forming low pustules on the outer surface. Asci 8-spored, J+ with an apical ring which stains intensely blue, 220-240 x 15-18 μm, walls and contents sometimes appearing brownish. Ascospores eguttulate ellipsoid, thin-walled at maturity and often collapsing in water, 16-21 x 11-12 μm, smooth or indistinctly ornamented; surface covering taking on the form of folds or wrinkles of the outer wall which are enhanced in solutions which loosen the epispore (such as ammonia and KOH), young spores thick-walled, up to 1 μm, contents granular; mature spores with granular contents. Paraphyses moniliform below, cells reaching a diam of 10-15 μm, the ultimate cell cylindrical 5 μm in diam, granular, somewhat brownish, shorter than the asci.

On soil at margins of melting snow banks.

Collections examined: USA: California. Sierra Co., Yuba Pass, 6700 ft, 18. v. 1986. D. H. Pfister and H. D. Thiers (FH). Utah. Summitt Co., Wasatch National Forest, Mill Creek, 14.vi. 1971, K. H. McKnight (12197) (Holotype of *P. phaeotheca*, BPI); SWITZERLAND: Kt. Graubunder, Arosa, Arlenwaldweg in dem "Steiner," ca 2000m, 11 May 1962, E. Rahm (K).

Taxonomic and nomenclatural notes -- Most of the investigations of the Pezizales found in the snow bank habitat have been carried out in Europe, the pertinent literature being that of Heim and Remy (1932), Heim (1947), Remy (1964), and Donadini (1977, 1978, 1979, 1980). In North America, McKnight and Dublin (1979) described a new species, *Peziza phaeotheca*, as a snow bank inhabitant.

The first of these species to be considered is *Galactinia nivalis* Heim and Remy. In the original description Heim and Remy (1932) listed ascospore size as 14-17 x 9-11 μm. The description was based on two collections one made in 1928 and the other in 1930 - neither has been located at PC. Confusion was perhaps inevitable regarding this name because in the same publication Heim and Remy (1932) proposed another name, *Aleuria nivalis* Heim & Remy, as a new combination. They may have intended to propose it as a new name but there was no reference to a basionym; there was no description. Today *Galactinia* and *Aleuria*, in this sense, are both included in *Peziza*. Heim and Remy followed Boudier and the French tradition in recognizing two genera with amyloid asci, elliptical ascospores, and complex excipular tissue -- *Galactinia* and *Aleuria sensu* Boudier *non sensu* Fuckel. *Aleuria nivalis* was meant to provide a replacement name for *Aleuria granulosa* (Schum.) Boud. *sensu* Boud. which currently would be recognized as a distinct, non-snow bank species of *Peziza*. Heim and Remy's circumscription of *Galactinia nivalis* was followed by Remy (1964), Breitenbach and Kränzlin (1981) and others. However, Heim (1947) had emended his concept of *G. nivalis* and transferred the species to *Aleuria*, creating a homonym of the earlier invalidly published *Aleuria nivalis* of 1932. In the emendation he gave the spore dimensions as 27-33 x 15-16 μm and wrote that *A. nivalis* of 1932 (discussed above and which remained a *nomen nudum*) would have to be abandoned. Heim recognized that there were two spore size ranges in these collections but he thought that the smaller spores were immature and that the several collections, both large- and small-spored, all represented the same species.

When Remy (1964) published his summary work on the basidiomycetes and discomycetes of Briançon, he did not accept Heim's 1947 concept of *A. nivalis* judging by the description he gave but he did use the name *Aleuria nivalis*. Although he increased the size range of the ascospores they were still described as being smaller than those listed by Heim (1947) for *A. nivalis*. Remy (1964) did name a new variety -- *A. nivalis* var. *alpina* Heim & Remy for which a Latin description was provided.

Donadini (1977, 1978, 1979, 1980) published a series of articles, the intent of which was to resolve some of the difficulties in the genus *Peziza* in general. Noting the confusion in the snow bank species and wishing to distinguish several taxa, Donadini (1977, 1978, 1979) proposed several new names. In his first paper on these taxa Donadini (1977, reprinted 1979) provided a name, *Peziza granularis*, for *Aleuria nivalis* Heim and Remy (1932) which was still a *nomen nudum*. In the same paper several other names were introduced. *Peziza ninguis* Donadini and Trimbach was validly published. *Peziza flos-nivium* Donadini was proposed as a "nov. nom." to replace *G. nivalis* Heim & Remy. Conceptually, Donadini associated this new name with Heim's 1947 delimitation of *A. nivalis*, defining the species as having ascospores 26-30 x 13-16 μm. Since this is a substitute for a previously validly published name, *P. flos-nivium* is superfluous. *Peziza fortoulii* Donadini & Neville was segregated as a new species because of the swollen, branched and deformed cells of the paraphyses. A Latin description was provided; the species is validly published.

Yet another new species, *Peziza nivis*, was described by Donadini (1978) and a brief Latin description was given. The species was small (1-8 mm) and was found on decaying grasses; it has ornamented spores, the ornamentations taking the form of fine irregular verrucae, and it has an orange-ochre to red-brown hymenium. *Peziza nivis* Donadini seems sufficiently distinct and characteristic to be recognized but its generic placement may be faulty. Donadini (1978) reduced his previously described species, *P. fortoulii*, to the rank of a variety of *P. ninguis*. Donadini (1980) summarized his work and views on the "Pezizes nivales" in an article and key. He included four species: *P. nivis, P. phaeotheca, P. nivalis, P. ninguis*, and one variety, *P. ninguis* var. *fortoulii*. He recognized *P. nivalis* (= *Galactinia nivalis sensu* Heim, 1947) and he considered his *P. flos-nivium* a synonym of it. This treatment has been followed by Hohmeyer (1986).

From my studies and from examination of the descriptions in the literature there appear to be two similar fungi that have been called *P. nivalis* but which can be separated on the basis of spore size. One species has large spores as characterized by Heim (1947) ranging from 27-33 x 15-16 μm. This conforms to Heim's emended concept of *Aleuria nivalis* and Donadini's name *Peziza flos-nivium*. Despite all the names proposed for these fungi, there is no name now available for this large-spored species. Heim & Remy's collections of *Galactinia nivalis* = *Peziza nivalis* may have been immature (the specimens can not be found to verify this) as Heim (1947) suggested but because several collections agree closely with the original concept of a species with spores ranging in size from 14-17 x 9-11 μm, a prudent course would be to maintain the name in the sense of the original description, i. e., for a small-spored species with brown or purple-brown hymenium.

Material from Laboratoire de Cryptogamie, Muséum National de'Histoire Naturelle, Paris, used by Heim (1947) to compose his emended description, was examined and found to agree with his description. The name *Peziza heimii* is proposed here for it.

Peziza heimii D. Pfister, **sp. nov.**
Peziza nivalis similis, sed ascis crassioribus 320-385 x 19-23 μm et sporis crassioribus 27-33 x 15-16 μm. Holotypus: "sur la terre, Pointe Pelouze, vers 2260m. alts., versant Nord, 14 Juin 1943, pres de Samoens, (Alpes)." PC

Several names have been disposed of here on nomenclatural or taxonomic grounds. *Peziza ninguis*, which has spores within the range of those for *P. nivalis,* and *P. phaeotheca* are here treated as synonyms of *P. nivalis*. It is remarkable that Donadini (1977, 1979) and McKnight and Dublin (1979) have provided SEM photographs of the spores of their respective species which show identical characteristic wrinkled or folded spore walls. This feature suggests, in conjunction with spore sizes and general similarities in descriptions, that these names refer to the same species. I have compared the two species through the courtesy of Kent McKnight who had deposited several collections of *P. phaeotheca* in BPI and who allowed me to examine material of *P. ninguis* sent to him by Donadini. My comparison of the two species led me to treat them as synonyms. My collection from California described above also has a tendency to show loosened spore walls which become folded or wrinkled. The dark color of the asci and hymenium mentioned by McKnight and Dublin are characteristic of other collections as well.

I have chosen to use the name *P. nivalis* for the North American collections realizing that the species concept put forth may appear to some to be broad. However, since these fungi are known from only a few collections and since the use of names in this complex has been both inconsistent and complicated on nomenclatural grounds, it seems fitting to attempt to stabilize usage at this juncture.

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LITERATURE CITED

Avizohar-Hershenzon, Z. and H. Nemlich. 1974. Pezizales of Israel. II. Pezizaceae. Israel J. Bot. 23: 151-163. 1974.

Breitenbach, J. and F. Kränzlin. 1981. Fungi of Switzerland. A contribution to the knowledge of the fungal flora of Switzerland. Verlag Mycologia. [Translated by V. L. and J. F. Waters]

Donadini, J. C. 1977. Le Genre *Peziza* L. per Saint-Amans (I). Bull. Soc. Linn. Provence 30: 37-92.

______ . 1978. Ibid. (II). Les Pezizes de Haute-Provence et de Dauphiné-Savoie. Bull. Soc. Linn. Provence 31: 9-39.

______ . 1979. Le Genre *Peziza* Linné per Saint-Amans. Doc. Mycol. 9(36): 1-42. [a reprint of the article above Donadini 1977]

______ . 1980. Le Genre *Peziza*. IV. Le Pezizes nivalis. Bull. Soc. Mycol. France 96: 247-248.

Heim, R. 1947. Sur quelques espèces nivales de Macromycètes des Alpes françaises. Rev. Mycol. 12: 69-78.

______ . and L. Remy. 1932. Fungi Brigantiani (Troisième Séries). Especes rares ou nouvelles de Discomycètes des Alpe Brainçonnaises. Bull. Soc. Mycol. France 48: 53-75.

Hohmeyer, H. 1986. Ein Schlussel zu den europaischer arten der Gattung *Peziza* L. Zeit. Mykol. 52: 161-188.

McKnight, K. H. and M. V. Dublin. 1979. A new *Peziza* from the snowbank flora of Western America. Sydowia Biheft 8: 224-227.

Remy, L. 1964. Contribution a l'étude de la Flore Mycologique Briançonnaise (Basidiomycètes et Discomycètes). Bull. Soc. Mycol. France 80: 459-585.

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TYPE SPECIMENS OF FUNGI MAINTAINED AT HERBARIUM PACIFICUM, BERNICE P. BISHOP MUSEUM, HONOLULU

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ABSTRACT

A listing of the 363 type specimens of 139 species of fungi on deposit in the collection at BISH is provided. The majority of the types are those collected in Hawaii by F. L. Stevens.

The Herbarium Pacificum (BISH), located at the Bishop Museum in Honolulu, maintains a number of type as well as other fungal specimens collected primarily from Hawaii but also from other regions in the central Pacific. Many collectors have contributed to the general collection, but the majority of type specimens were collected by F. L. Stevens documenting his publication "Hawaiian Fungi" (Stevens, 1925).

Stevens collected fungi in Hawaii for a four and a half month period in 1921 as a Bishop Fellow of Yale University. Prior to coming to Hawaii, he had spent two years in Puerto Rico, and thus was familiar with tropical plants. Stevens collected approximately 1200 specimens in Hawaii, and described 10 new genera and about 146 new species. He left 119 types in BISH. Stevens' publication remains the single most definitive work on Hawaiian fungi, even though it is only a partial representation of the mycobiota. It contains virtually nothing on polypores or mushrooms, and many other groups are omitted, but it documents a fairly broad range of the fungi, particularly leaf inhabiting species. When Stevens came to Hawaii, an estimated 130 species of fungi had been identified. Stevens documented 163 genera in his publication, and greatly increased the number of known species, listing about 370, based mostly on his own collections. Before his arrival, four species of *Meliola* were known from the islands; Stevens increased this number to thirty-four. While checklists of Hawaiian fungi have been published (Parris, 1940; Raabe, Conners and Martinez, 1981), Stevens remains the only one to have attempted a comprehensive work on the fungi known from Hawaii. It is a work that is in urgent need of updating and expansion.

Because BISH has not had an active systematic mycology program, it is probable that the fungal collections have not been used as extensively as they should have been, even though a number of important specimens are included. For this reason, it is useful to provide a list of type specimens housed at BISH with references to the appropriate literature.

This paper lists the type specimens housed at BISH, with the sheet numbers, host or substrate on which found, and references for the original description and for the place of lectotypification, where applicable. The fungi are listed by basionym. Current taxonomic disposition of the name has been included in the "Index to Changed Names" following the listing of types. For most of the new species described in Stevens' 1925 publication, several specimens were so annotated, and what would now be called the holotype sheet was not unequivocally identified. (The characterizations such as holotype, isotype, etc., had not been in general use until the "International Code of Botanical Nomenclature" was adopted at the Seventh International Botanical Congress in Stockholm in 1950.) In accordance with the Code, most of his specimens are carried at BISH as syntypes, unless a lectotype has been designated.

The collection was reviewed by the senior author in 1990 under NSF Grant No. BSR-8912364.

1. *Actinodothis perrottetiae* F. Stevens, Bernice P. Bishop Mus. Bull. 19: 51, 1925.
   SYNTYPES: *Stevens 717* = BISH 499877, 499878.

Host: *Perrottetia sandwicensis* A. Gray

2. *Actinodothis suttoniae* F. Stevens, loc. cit. 51.
SYNTYPES: *Caum (Stevens no.143)* = BISH 499875, 499876.
Host: *Suttonia lessertiana* (A. DC) Mez

3. *Alternaria sonchi* F. Stevens, loc. cit. 153.
SYNTYPES: *Stevens 6* = BISH 499869, 499873; *Stevens 12* = BISH 145650, 499872; *Stevens 104* = BISH 145652, 499874; *Stevens 221* = BISH 145653, 499871; *Stevens 420* = BISH 145654, 499870.
Host: *Sonchus oleraceus* L.

4. *Amazonia ohianus* F. Stevens, loc. cit. 50.
SYNTYPES: *Stevens 842* = BISH 499867, 499868.
Host: *Metrosideros polymorpha* Gaud.

5. *Amazonia perrottetiae* F. Stevens, loc. cit. 47.
SYNTYPES: *Stevens 717a* = BISH 499865, 499866.
Host: *Perrottetia sandwicensis* A. Gray

6. *Anomothallus erraticus* F. Stevens, loc. cit. 91.
SYNTYPES: *Stevens 1138* = BISH 145888, 499864.
Host: *Rubus macraei* A. Gray (publ. as *R. hawaiiensis* A. Gray)

7. *Antennellina hawaiiensis* Mendoza, in F. Stevens, loc. cit. 55.
SYNTYPES: *Stevens 266* = BISH 499859, 499863.
Host: *Mangifera indica* L.

8. *Asterina gouldiae* F. Stevens & R. Ryan, in F. Stevens, loc. cit.73.
SYNTYPES: *Stevens 494* = BISH 499857, 499861.
Host: *Gouldia coriacea* (Hook. & Arnott) Hillebr.

9. *Asterina kauaiensis* F. Stevens & R. Ryan, loc. cit. 73.
SYNTYPES: *Stevens 479* = BISH 499856, 499860.
Host: Unknown.

10. *Asterina lobeliae* F. Stevens & R. Ryan, loc. cit. 74.
SYNTYPES: *Swezey (Stevens no. 1063)* = BISH 499854, 499855.
Host: *Lobelia sp.*

11. *Asterina phyllostegiae* F. Stevens & R. Ryan, loc. cit. 73.
    SYNTYPES: *Stevens 718* = BISH 499852, 499853.
        Host: *Phyllostegia sp.*

12. *Asterinella mabae* F. Stevens & R. Ryan, loc cit. 75.
    SYNTYPE: *Swezey (Stevens no.1995)* = BISH 499851
        Host: *Osmanthus sandwicensis* (A. Gray) Knobl.
    POSSIBLE SYNTYPES: *Swezey s.n.* = BISH 499849, 499850.
        Host: *M. hillebrandii* Seem.

13. *Aulographella baumeae* F. Stevens & R. Ryan, loc. cit. 77.
    SYNTYPES: *Stevens 390* = BISH 499847, 499848.
        Host: *Baumea meyenii* Kunth

14. *Beelia suttoniae* F. Stevens & R. Ryan, loc. cit. 71.
    SYNTYPES: *Munro (Stevens no. 421)* = BISH 499845, 499846.
        Host: *Suttonia lanaiensis* (Hillebr.) Mez

15. *Bitancourtia cassythae* Thirumalachar & A. Jenkins, Mycologia 45: 782, 1953.
    SYNTYPES: *Thirumalachar & Jenkins 488* = BISH 506362, 506363.
        Host: *Cassytha filiformis* L.

16. *Botryosphaeria pipturi* D. Gardner & Hodges, Mycologia 80: 460, 1988.
    ISOTYPE: *Gardner & Hodges s.n.* = BISH 511584.
        Host: *Pipturus hawaiiensis* H. Lév.

17. *Calothyriella osmanthi* F. Stevens & R. Ryan, in F. Stevens, Bernice P. Bishop Mus. Bull. 19: 70, 1925.
    SYNTYPES: *Stevens 135* = BISH 145748, 499844.
        Host: *Osmanthus sandwicensis* (A. Gray) Knobl.

18. *Calothyriopeltis clermontiae* F. Stevens & R. Ryan, loc. cit. 72.
    SYNTYPES: *Stevens 478* = BISH 499842, 499843.
        Host: *Clermontia oblongifolia* Gaud.

19. *Calothyriopeltis metrosideri* F. Stevens & R. Ryan, loc. cit. 72.
    SYNTYPES: *Stevens 636* = BISH 499840, 499841.
        Host: *Metrosideros sp.*

20. *Cercospora agerati* F. Stevens, loc. cit. 154.
SYNTYPES: *Stevens 750* = BISH 499042, 499983; *Stevens 944* = BISH145751, 499984
Host: *Ageratum conyzoides* L.

21. *Cercospora arctii* F. Stevens, loc. cit. 154
SYNTYPES: *Stevens 1096* = BISH 499982, 499041.
Host: *Arctium lappa* L.

22. *Cercospora pipturi* F. Stevens & Glick, in F. Stevens, loc. cit. 155.
SYNTYPES: *Stevens 114* = BISH 500379; *Stevens 538* = BISH 145766, 499909, 500301; *Stevens 713* = BISH 145765. 500380; *Stevens 894* = BISH 145674, 500381; *Stevens 1140* = BISH 145763.
Host: *Pipturus albidus* (Hook. & Arnott) A. Gray

23. *Cercospora tectoniae* F. Stevens, loc. cit. 52.
SYNTYPES: *Stevens 52* = BISH 499040, 499908.
Host: *Tectona grandis* L. f.

24. *Chaetothyrium hawaiiense* Mendoza, in F. Stevens, loc. cit. 56.
SYNTYPES: *Stevens 577* = BISH 499014, 499918.
Host: *Morinda citrifolia* L.

25 *Chaetothyrium mangiferae* Mendoza, loc. cit. 57.
SYNTYPES: *Stevens 267* = BISH 499013, 499917.
Host: *Mangifera indica* L.

26. *Chaetothyrium straussiae* Mendoza, loc. cit. 56.
SYNTYPES: *Stevens 157* = BISH 499012, 499916.
Host: *Straussia mariniana* (Chamisso & Schlechtend.) A. Gray

27. *Clathrus oahuensis* Dring, Meeker & Goos, Mycologia 63: 893, 1971.
ISOTYPE *Meeker & Stump s.n.* = BISH 489915.
Host: On soil.

28. *Clypeolella clermontiae* F. Stevens & R. Ryan, in F. Stevens, Bernice P. Bishop Mus. Bull. 19: 72, 1925.
SYNTYPES: *Stevens 1154b* = BISH 499862, 499858.

Host: *Clermontia sp.*

29. *Colletotrichum dianellae* F. Stevens & P. A . Young, in F. Stevens, loc. cit. 447.
SYNTYPES: *Stevens 447* = BISH 499011, 499914.
Host: *Dianella odorata* sensu Hillebr., non Blume

30. *Collectotrichum passiflorae* F. Stevens & P. A. Young, loc. cit. 146.
SYNTYPES: *Stevens 465* = BISH 145782, 499913; *Stevens 914* = BISH 499010, 508404.
Host: *Passiflora edulis* Sims; *P. laurifolia* L.

31. *Crepidotus bakerae* Ueki & C. W. Smith, Canadian J. Bot. 51: 1253, 1973.
HOLOTYPE: *Ueki 39* = BISH 499009
Host: On rotting wood of *Mangifera indica* L.

32. *Dasyscypha sadleriae* F. Stevens & P. A. Young, in F. Stevens, Bernice P. Bishop Mus. Bull. 19: 11, 1925.
SYNTYPES: *Stevens 1078* = BISH 499000, 499903.
Host: *Sadleria sp.*

33. *Deightoniella hawaiiensis* Goos & Uecker, ined.
HOLOTYPE: *Lohman 155* = BISH 599724
Host: On decayed wood of unidentified tree.

34. *Dendrophoma gouldiae* F. Stevens & Plunkett, in F. Stevens, Bernice P. Bishop Mus. Bull. 19: 35, 1925.
SYNTYPES: *Stevens 499* = BISH 486023, 499007.
Host: *Gouldia coriacea* (Hook. & Arnott) Hillebr.

35. *Echidnodella cocculi* F. Stevens & R. Ryan, in F. Stevens, loc. cit. 76.
SYNTYPES: *Stevens 989* = BISH 145811, 499910; *Stevens 998a* = BISH 499937; *Forbes1729.O,* (publ. as *1729*) = BISH 145812, 499912.
Host: *Cocculus ferrandianus* Gaud.

36. *Echidnodella imadae* Goos & Uecker, ined.
HOLOTYPE: *Imada & Goos s.n.* = BISH 599722
Host: *Canthium odoratum* (G. Forster) Seem.

37. *Echidnodella mabae* F. Stevens & R. Ryan, in F. Stevens, Bernice P. Bishop Mus. Bull. 19: 76, 1925.
SYNTYPES: *Swezey, s.n.* = BISH 145813, 499938, 499939, 499940.
Host: *Maba sandwicensis* A. DC

38. *Echidnodes pisoniae* F. Stevens & R. Ryan, loc. cit. 76.
SYNTPES: *Stevens 651* = BISH 499942, 499941.
Host: *Pisonia sandwicensis* Hillebr.

39. *Elsinoe vaccinii* D. Gardner & Hodges, Mycologia 78: 506, 1984.
ISOTYPE: *Gardner & Hodges s.n.* = BISH 486806
Host: *Vaccinium reticulatum* Sm.

40. *Enthallopycnidium gouldiae* F. Stevens, Bernice P. Bishop Mus. Bull. 19: 85, 1925.
SYNTYPES: *Stevens 1073a* = BISH 499906, 499907
Host: *Gouldia sp.*

41. *Excioconidium cibotii* Plunkett, in F. Stevens, loc. cit.156.
POSSIBLE SYNTYPE: *Stevens 811* (publ. as *810*) = BISH 486050, 499005
Host: *Cibotium chamissoi* Kaulf.

42. *Gloeosporium peleae* F. Stevens, loc. cit. 144.
SYNTYPE: *Stevens 632* = BISH 499004.
Host: *Pelea sp.*

43. *Graphium dubautiae* F. Stevens & A. G. Weedon, in F. Stevens, loc. cit. 159.
SYNTYPE: *Stevens 650* = BISH 499003.
Host: *Dubautia laxa* Hook. & Arnott

44. *Guignardia alyxiae* F. Stevens, loc. cit. 101.
SYNTYPE: *Stevens 199* = BISH 145833, 499906; *Stevens 308* = BISH 499002,499905.
Host: *Alyxia olivaeformis* Gaud.

45. *Guignardia jussiaeae* F. Stevens, loc. cit. 101.
SYNTYPE: *Lyon 86* = BISH 499001.
Host: *Jussiaea villosa* sensu Hillebr., non Lam.

46. *Guignardia musae* F. Stevens, loc. cit. 101.
SYNTYPE: Stevens 565 = BISH 499904, 596860.
Host: *Musa x paradisiaca* L. (publ. as *Musa sp.*)

47. *Harknessia gunnerae* F. Stevens and P. A. Young, in F. Stevens, loc. cit. 136
SYNTYPE: *Stevens 1143a* = BISH 499908.
Host: *Gunnera petaloidea* Gaud.
POSSIBLE SYNTYPE: *Stevens 1143* (publ. as *1143a*) = BISH 501430.
Host: *Gunnera petaloidea* Gaud.

48. *Harknessia hawaiiensis* F. Stevens & P. A. Young, loc. cit. 136.
SYNTYPES: *Lyon 124* = BISH 499901, 499902.
Host: *Eucalyptus robusta* Sm.

49. *Helicodendron minutum* Goos & Uecker, ined.
HOLOTYPE: *Lohman s.n.* = BISH 599725
Host: On bark of undetermined tree.

50. *Helminthosporium gleicheniae* F. Stevens & Glick, in F. Stevens, loc. cit. 152.
SYNTYPES: *Stevens 223* = BISH 499893; *Stevens 283* = BISH 145838, 499896, 499897; *Stevens 371* = BISH 145840, 499899; *Stevens 509* = BISH 145841, 498898; *Stevens 673* = BISH 145839, 499900.
Host: *Gleichenia dichotoma* Hook.

51. *Irene cheirodendronis* F. Stevens, loc. cit. 44; Lecto: Hansford, Beih. Sydowia 2: 481, 1961.
ISOLECTOTYPES: *Swezey (Stevens no.1165)* = BISH 499894, 499895.
Host: *Cheirodendron gaudichaudii* Seem.

52. *Irene cyrtandrae* F. Stevens, Bernice P. Bishop Mus. Bull. 19: 44, 1925.
SYNTYPES: *Stevens 481* = BISH 499891, 499892.
Host: *Cyrtandra lessoniana* Gaud.

53 . *Irene scaevolicola* F. Stevens, loc. cit. 45.

SYNTYPES: *Stevens 160* = BISH 145902, 499888, 499889, 499890.
Host: *Scaevola chamissoniana* Gaud.

54. *Irene splendens* F. Stevens, loc. cit. 430; Lecto: Hansford, Beih. Sydowia 2: 363, 1961.
ISOLECTOTYPES: *Stevens 430* = BISH 499886, 499887.
Host: *Alphitonia excelsa* H. Mann

55. *Lembosia eucalypti* F. Stevens & Dixon, in F. Stevens, Bernice P. Bishop Mus. Bull. 19: 75, 1925.
SYNTYPES: *Stevens 874* = BISH 502014, 502015.
Host: *Eucalyptus sp.*

56. *Leptothyrium gleicheniae* F. Stevens & P. A. Young, in F. Stevens, loc. cit. 143.
SYNTYPES: *Stevens 153* = BISH 499884, 146929.
Host: *Gleichenia sp.*

57. *Leptothyrium pothi* A. Weedon, in F. Stevens, loc. cit. 143.
SYNTYPES: *Stevens 883*, BISH 499882, 499883.
Host: *Pothos sp.*

58. *Leptothyrium sidae* F. Stevens & P. A. Young, in F. Stevens, loc. cit. 142.
SYNTYPES: *Stevens 912* = BISH 499879, 499880; *Stevens 1152*, 145931, 499881.
Host: *Sida spinosa* L.

59. *Limaciniella psidii* Mendoza, in F. Stevens, loc. cit. 58.
SYNTYPES: *Stevens 542* = BISH 499935, 499936.
Host: *Psidium guajava* L.

60. *Limaciniopsis rollandiae* Mendoza, loc. cit. 58.
SYNTYPES: *Stevens 407* = BISH 499970, 499971.
Host: *Rollandia racemosa* Hillebr.

61. *Lophodermium sacchari* H. Lyon, 1913, Hawaiian Pl. Rec. 9: 600
HOLOTYPE: *Lyon 291* = BISH 487733
Host: *Saccharum officinarum* L.

62. *Massalongiella canavaliae* F. Stevens & P. A. Young, in F. Stevens, Bernice P. Bishop Mus. Bull. 19: 98, 1925.
SYNTYPE: *Lyon 312* = BISH 499036.
Host: *Canavalia sp.*

63. *Meliola alyxiae* F. Stevens, loc. cit. 30.
SYNTYPES: *Stevens 217* = BISH 499034, 499969.
Host: *Alyxia olivaeformis* Gaud.

64. *Meliola dracaenae* F. Stevens, loc. cit. 40.
SYNTYPES: *Stevens 419* = BISH 499032, 499033.
Host: *Dracaena aurea* H. Mann

65. *Meliola gregoriana* F. Stevens, loc. cit. 39, Lecto: Hansford, Beih. Sydowia 2: 711, 1961.
ISOLECTOTYPE: *Forbes 2306.O* (publ. as *Forbes-Stevens 2306*) = BISH 499031.
Host: *Dianella odorata* sensu Hillebr., non Blume

66. *Meliola hawaiiensis* F. Stevens, Bernice P. Bishop Mus. Bull. 19: 37, 1925.
SYNTYPES: Stevens 667 = BISH 499030, 499968, 502016, 502017.
Host: *Eugenia sandwicensis* A. Gray

67. *Meliola juddiana* F. Stevens, loc. cit. 32.
SYNTYPES: *Stevens 986* = BISH 499029, 499967.
Host: *Pelea sp.*

68. *Meliola kaduae* F. Stevens, loc. cit. 30.
SYNTYPES: *Stevens 601* = BISH 145986, 499966.
Host: *Gouldia sp.*

69. *Meliola kauaiensis* F. Stevens, loc. cit. 39.
SYNTYPES: *Stevens 531* = BISH 499028, 499965.
Host: *Kadua sp.*

70. *Meliola koae* F. Stevens, loc. cit. 34.
SYNTYPES: *Stevens 163* = BISH 145987, 145988, 499027, 499964.
Host: *Acacia koa* A. Gray

71. *Meliola lobeliae* F. Stevens, loc. cit. 29.
SYNTYPES: *Stevens 1154* = BISH 499026, 499963.
Host: *Clermontia sp.*

72. *Meliola lyoni* F. Stevens, loc. cit. 37.
SYNTYPES: *Stevens 843* = BISH 499025, 499962.
Host: *Eugenia sandwicensis* A. Gray

73. *Meliola morbosa* F. Stevens, loc. cit. 38.
SYNTYPES: *Stevens 452* = BISH 499024, 499961.
Host: *Claoxylon sandwicense* Müll. Arg.

74. *Meliola osmanthi* Sydow var. *hawaiiensis* Hansford, Sydowia 9: 44, 1955.
ISOTYPE: *Caum 146* = BISH 145996.
Host: *Osmanthus sandwicensis* (A. Gray) Knobl.

75. *Meliola osmanthicola* Hansford, loc. cit. 70.
ISOTYPE: *Stevens 513* = BISH 499023.
Host: *Osmanthus sandwicensis* (A. Gray) Knobl.

76. *Meliola osmanthina* Hansford, loc. cit. 70.
ISOTYPE; Stevens 573 = BISH 499960.
Host: *Osmanthus sandwicensis* (A. Gray) Knobl.

77. *Meliola peleae* F. Stevens, Bernice P. Bishop Mus. Bull. 19: 34, 1925.
SYNTYPES: *Stevens 840* = BISH 499022, 499959.
Host: *Pelea sp.*

78. *Meliola sandwicensis* Ellis & Everhart var. *major* Hansford, Beih. Sydowia 2 : 589, 1961.
ISOTYPES: *Stevens 446* = BISH 146031, 486218.
Host: *Gouldia coriaceae* (Hook. & Arnott) Hillebr.

79. *Meliola sideroxyli* F. Stevens, Bernice P. Bishop Mus. Bull. 19: 35, 1925; Lecto: Hansford, Beih. Sydowia 2: 504, 1961.
ISOLECTOTYPES: *Stevens 1160* = BISH 499021, 499958.
Host: *Sideroxylon sandwicense* (A. Gray) Benth. & Hook. ex Hillebr.

80. *Meliola vaccinii* F. Stevens, Bernice P. Bishop Mus. Bull. 19: 30, 1925.
SYNTYPES: *Stevens 739* = BISH 499020, 499957.
Host: *Vaccinium reticulatum* Sm.

81. *Meliola visci* F. Stevens, loc. cit. 38; Lecto: Hansford, Beih. Sydowia 2: 589, 1961.
ISOLECTOTYPES: *Stevens 167* = BISH 499019, 499956.
Host: *Viscum articulatum* sensu Hillebr., non N. L. Burm.

82. *Meliolina haplochaeta* Sydow, in H. Sydow & P. Sydow, Ann. Mycol. 15: 145, 1917.
SYNTYPE: *Lyon L1* = BISH 499018.
Host: *Metrosideros collina* (J.R. Forster & G. Forster) A. Gray` subsp. *polymorpha* (Gaud.) Rock

83. *Meliolina sydowiana* F. Stevens, Bernice P. Bishop Mus. Bull 19: 46, 1925.
SYNTYPES: *Stevens 639* = BISH 499017, 499953; *Stevens 721* = BISH 146046, 499951; *Stevens 788* = BISH 146043, 499952; *Stevens 976* = BISH 146045, 499954; *Stevens 1144* = BISH 146042, 499950; *Stevens 1145* = BISH 146044, 499949.
Host: *Metrosideros collina* (J.R. Forster & G. Forster) A. Gray subsp. *polymorpha* (Gaud.) Rock var. *incana* (H. Lév.) Rock

84. *Metasphaeria hawaiiensis* F. Stevens & P. A. Young, in F. Stevens, loc. cit. 106.
SYNTYPES: *Stevens 826* = BISH 499947, 499948.
Host: *Metrosideros polymorpha* Gaud.

85. *Microthyriella hibisci* F. Stevens, loc. cit. 88.
SYNTYPES: *Stevens 5* = BISH 146048, 499944; *Stevens 189* = BISH 146050, 499945; *Stevens 193* = BISH 146049, 146051, 499943, 499946.
Host: *Hibiscus,* cultivated.

86. *Mycoenterolobium platysporum* Goos, Mycologia 62: 172, 1970.
ISOTYPE: *Goos H-56* = BISH 508410.
Host: Rotting *Auraucaria* wood

87. *Mycosphaerella cyaneae* F. Stevens & P. A. Young, in F. Stevens, Bernice P. Bishop Mus. Bull. 19: 101, 1925.
SYNTYPES: *Stevens 723* = BISH 499077, 499994.
Host: *Cyanea angustifolia* Hillebr.

88. *Mycosphaerella dianellae* F. Stevens & A. Weedon, in F. Stevens, loc. cit. 102.
SYNTYPES: *Stevens 421* = BISH 499076, 499993.
Host: *Dianella odorata* sensu Hillebr., non Blume

89. *Mycosphaerella freycinetiae* F. Stevens, loc. cit. 103.
SYNTYPES: *Forbes 3* = BISH 486899, 499075.
Host: *Freycinetia arnottii* Gaud.

90. *Mycosphaerella hawaiiensis* F. Stevens & P. A. Young, in F. Stevens, loc cit. 103.
POSSIBLE SYNTYPES: *Stevens 1143* (publ. as *1143b*) = BISH 499074, 499992
Host: *Gunnera petaloidea* Gaud.

91. *Mycosphaerella hedychii* F. Stevens & P. A. Young, loc. cit. 103.
SYNTYPES: *Stevens 744* = BISH 499073, 499991.
Host: *Hedychium coronarium* J. König

92. *Mycosphaerella kaduae* F. Stevens & P. A. Young, in F. Stevens, loc. cit. 103.
SYNTYPES: *Stevens 93* = BISH 146061, 499990; *Bergman (Stevens no. 112)* = BISH 499072, 499989; *Stevens 602* = BISH 146059, 146060.
Host: *Gouldia sp.*

93. *Mycosphaerella metrosideri* F. Stevens & P. A. Young, loc. cit. 104.
SYNTYPES: *Stevens 159* = BISH 146064, 499986; *Stevens 183* = BISH 499071, 499988; *Lyon 481* = BISH 146063; *Stevens 716* = BISH 146062, 499987.
Host: *Metrosideros polymorpha* Gaud.

94. *Mycosphaerella scaevolae* F. Stevens & P. A. Young, loc. cit. 104.
SYNTYPES: *Stevens 660* = BISH 499070, 499985.

Host: *Scaevola chamissoniana* Gaud.

95. *Oligostroma suttoniae* F. Stevens, loc. cit. 22.
SYNTYPES: *Stevens 868a* = BISH 499039, 499981.
Host: *Suttonia lessertiana* (A. DC) Mez

96. *Pauahia sideroxyli* F. Stevens, loc. cit. 17.
SYNTYPE: *Lyon 61* = BISH 499038.
Host: *Sideroxylon rhyncospermum* Rock

97. *Peltella freycinetiae* F. Stevens & R. Ryan, in F. Stevens, loc. cit. 69.
SYNTYPES: *Stevens 977* = BISH 499979, 499880.
Host: *Freycinetia arnotti* Gaud.

98. *Phaeosaccardinula morindae* Mendoza, in F. Stevens, loc. cit. 59.
SYNTYPES: *Stevens 572* = BISH 499977, 499978.
Host: *Morinda citrifolia* L.

99. *Phaeosphaerella mangiferae* F. Stevens & A. Weedon, in F. Stevens, loc. cit.105.
SYNTYPES: *Stevens 583* = BISH 499037, 499976.
Host: *Mangifera indica* L.

100. *Phragmocapnias smilicina* Mendoza, in F. Stevens, loc. cit. 58.
SYNTYPES: *Stevens 670* = BISH 499972, 499973, 499974;
Stevens 981 = BISH 499975.
Host: *Pelea sp.*, *Smilax sp.*

101. *Phyllachora freycinetiae* F. Stevens, loc. cit. 22.
SYNTYPES: *Stevens 184* = BISH 500003, 500342.
Host: *Freycinetia arnottii* Gaud.

102. *Phyllosticta codiaei* F. Stevens & P. A. Young, in F. Stevens, loc. cit. 129.
SYNTYPE: *Stevens 31* = BISH 500002.
Host: *Codiaeum moluccaneum* sensu Hillebr., non L.

103. *Phyllosticta colocasiophila* A. Weedon, in F. Stevens, loc. cit. 129.
SYNTYPE: *Stevens 873* = BISH 500340; *Stevens 943* = BISH 500341.

Host: *Colocasia sp.* (taro)
Note: Another specimen of each of these Stevens numbers is on loan.

104. *Phyllosticta cordylinophila* P. A. Young, in F. Stevens, loc. cit. 133.
SYNTYPES: *Stevens 1132* = BISH 500001, 500339, 146157.
Host: *Cordyline terminalis* (L.) Kunth

105. *Phyllosticta erechtitis* F. Stevens & P. A. Young, in F. Stevens, loc. cit. 131.
SYNTYPES: *Stevens 543* = BISH 146159, 146160, 486966, 499090.
Host: *Erechtites hieracifolia* (L.) Raf. ex DC

106. *Phyllosticta heliconiae* F. Stevens & P. A. Young, loc. cit. 131.
SYNTYPES: *Stevens 574* = BISH 499089, 500338.
Host: *Heliconia sp.*

107. *Phyllosticta musae* F. Stevens & P. A. Young, loc. cit. 132.
SYNTYPES: *Stevens 76* = BISH 499088, 500337.
Host: *Musa sp.* (banana)

108. *Phyllosticta musicola* F. Stevens & P. A. Young, loc. cit. 132.
SYNTYPE: *Lyon s.n.* = BISH 499087.
Host: *Musa sp.* (banana)

109. *Phyllosticta pothicola* A. Weedon, in F. Stevens, loc. cit. 132.
SYNTYPES: *Stevens 25* = BISH 499086, 500336.
Host: *Pothos sp.*

110. *Phyllosticta zingiberis* F. Stevens & R. Ryan, in F. Stevens, loc. cit. 133.
SYNTYPES: *Stevens 655* = BISH 499085, 500335; *Stevens 961* = BISH 500335, 146168.
Host: *Zingiber zerumbet* (L.) Sm.

111. *Pirostoma dianellae* F. Stevens & P. A. Young, in F. Stevens, loc. cit. 143.
SYNTYPES: *Stevens s.n.* = BISH 499084, 500333.
Host: *Dianella odorata* sensu Hillebr.

112. *Pluriporus gouldiae* F. Stevens & R. Ryan, in F. Stevens, loc. cit. 455.
SYNTYPES: *Stevens 455* = BISH 500331, 500332.
Host: *Gouldia coriacea* (Hook. & Arnott) Hillebr.

113. *Polystomella kaduae* F. Stevens & R. Ryan, loc. cit. 65.
SYNTYPES: *Stevens1005* = BISH 500328, 500329, 500330.
Host: *Kadua glomerata* Hook. & Arnott

114. *Puccinia rugispora* D. Gardner, Mycologia 82: 141, 1990.
ISOTYPE: *Marr s.n.* = BISH 527619, 527620.
Host: *Zanthoxylum dipetalum* H. Mann

115. *Pucciniastrum wikstroemiae* Arthur, in F. Stevens, Bernice P. Bishop Mus. Bull. 19: 115, 1925.
SYNTYPES: *Stevens 892* = BISH 146257, 500327.
Host: *Wikstroemia uva-ursi* A. Gray

116. *Ramularia ipomoeae* F. Stevens, loc. cit. 150.
SYNTYPES: *Stevens 908* = BISH 499083, 500326.
Host: *Ipomoea bona-nox* L. (moonflower, cult.)
Note: *Sphaerulina ipomoeae* F. Stevens is on the same sheets.

117. *Ramularia microlepiae* F. Stevens, loc. cit. 151.
SYNTYPES: *Stevens 169* = BISH 146266, 500318; *Stevens 175* = BISH 146264, 500316; *Stevens 255* = BISH 146261, 500317; *Stevens 282* = BISH146263, 500325; *Stevens 336* = BISH 146258, 500320; *Stevens 391* = BISH 146259, 500319; *Stevens 500* = BISH 146265, 500323; *Stevens 606* = BISH 146262, 500324; *Stevens 729* = BISH 499082, 500321; *Stevens 1155* = BISH 146260, 500322.
Host: *Microlepia sp.*

118. *Schizochora pandani* F. Stevens, loc. cit. 20.
SYNTYPES: *Stevens 187* = BISH 146276, 500315, 499081, 500314.
Host: *Pandanus odoratissimus* sensu Hillebr., and Rock

119. *Sebacina farinacea* D. P. Rogers, Pacific Sci. 1: 97, 1947.
SYNTYPE: *Rogers 1884* = BISH 499080.

Host: *Cocos nucifera* L.

120. *Sebacina petiolata* D. P. Rogers, loc. cit. 99.
SYNTYPE: *Rogers 1475* = BISH 499079.
Host: *Cocos nucifera* L.

121. *Septoria canavaliae* H. Lyon ex Sydow, Fung. Exot. No. 191, Ann. Mycol. 11: 388, 1913.
ISOTYPE: *Lyon 264* = BISH 500313.
Host: *Canavalia ensiformis* (L.) DC (cult.)

122. *Septoria clermontiae* F. Stevens & P. A. Young, in F. Stevens, Bernice P. Bishop Mus. Bull. 19: 138, 1925.
SYNTYPES: *Stevens 98* = BISH 146286, 500371; *Stevens 659* = BISH 500012, 500372.
Host: *Clermontia kakeana* Meyen; *Clermontia sp.*

123. *Septoria gouldiae* F. Stevens & P. A. Young, loc cit. 138.
SYNTYPES: *Stevens 602* = BISH 500011, 500369; *Stevens 613* = BISH 46287, 500370.
Host: *Gouldia lanceolata* (Wawra) A. Heller

124. *Septoria rollandiae* F. Stevens & P. A. Young, loc. cit. 140.
SYNTYPES: *Stevens 706* = BISH 500010, 500368.
Host: *Rollandia crispa* Gaud.

125. *Seynesia atkinsonii* F. Stevens & R. Ryan, in F. Stevens, loc. cit. 69.
SYNTYPE: *Stevens 300* = BISH 500367.
Host: *Freycinetia arnotti* Gaud.

126. *Seynesiopeltis tetraplasandrae* F. Stevens & R. Ryan, loc. cit. 70.
SYNTYPE: *Stevens 1089* = BISH 500366
Host: *Tetraplasandra hawaiiensis* A. Gray

127. *Sphaerulina cibotii* F. Stevens & E. Guba, in F. Stevens, loc. cit. 105.
SYNTYPES: *Stevens 545* = BISH 146321, 146324, 146325, 500364; *Stevens 1003* = BISH 500009, 500365.
Host: *Cibotium menziesii* Hook.

128. *Sphaerulina ipomoeae* F. Stevens, loc. cit. 105.
SYNTYPES: *Stevens 908* = BISH 499083, 500326.
Host: *Ipomoea bona-nox* L. (moonflower, cult.)
Note: *Ramularia ipomoeae* F. Stevens is on the same sheets.

129. *Stagonospora erythhrinae* F. Stevens & P. A. Young, in F. Stevens, loc. cit. 137.
SYNTYPES: *Stevens 1019* = BISH 500008, 500363.
Host: *Erythrina monosperma* Gaud.

130. *Trabutia minima* F. Stevens & A. Weedon, in F. Stevens, loc. cit. 18.
SYNTYPES: *Stevens 445* = BISH 500007, 500362.
Host: Unknown dicotyledonous plant.

131. *Trichopeltis rhyacoides* F. Stevens, loc. cit. 84.
SYNTYPES: *Stevens 985* = BISH 500360, 500361.
Host: *Alyxia olivaeformis* Gaud.

132. *Uredo hawaiiensis* Arthur, in F. Stevens, loc. cit. 124.
SYNTYPE: *Stevens 880 = BIS*H 500006.
Host: *Carex wahuensis* C. A. Mey.

133. *Uredo stevensii* Arthur, loc. cit. 124; Lecto: Hennen & Hodges, Mycologia 73: 1122, 1981.
ISOLECTOTYPE: *Stevens 428* = BISH 500005.
Host: *Euphorbia clusiaefolia* Hook. & Arnott

134. *Uredo vulcani* D. Gardner, Mycologia 80: 747, 1988.
ISOTYPES: *Gardner s.n.* = BISH 509308, 509309.
Host: *Coprosma rhynchocarpa* A. Gray

135. *Uromyces alyxiae* Arthur, in F. Stevens, Bernice P. Bishop Mus. Bull. 19: 117, 1925.
SYNTYPES: *Stevens 520* = BISH 500358, 500359
Host: *Alyxia olivaeformis* Gaud.

136. *Uromyces koae* Arthur, loc. cit. 118.
SYNTYPE: *Lyon s.n.* = BISH 500004.
Host: *Acacia koa* A. Gray

137. *Yoshinagella nuda* F. Stevens, loc. cit. 16.
SYNTYPES: *Stevens 151* = BISH 146466, 500351; *Stevens 155* = BISH 146465, 500348; *Stevens 286* = BISH 146459, 500347; *Stevens 305* = BISH 146462, 500346: *Stevens 307* = BISH 146460, 500344; *Stevens 388* = BISH 500343, 500352; *Stevens 591* = BISH 146467, 500350; *Stevens 656* = BISH 146468, 500349; *Stevens 664* = BISH 146461, 500345; *Lyon 331* = BISH 146464; *Lyon 419* = BISH 146463
Host: *Cibotium chamissoi* Kaulf.

138. *Yoshinagella polymorpha* H. Lyon ex F. Stevens, loc. cit. 14.
SYNTYPE: *Stevens 694* = BISH 500353.
Host: *Cibotium menziesii* Hook.

139. *Yoshinagella polymorpha* H. Lyon ex F. Stevens var. *pauciseta* F. Stevens, loc. cit. 16.
SYNTYPES: *Stevens 1066* = BISH 146470, 500356; *Stevens 1077* = BISH 500354, 500355; *Stevens 1156* = BISH 500357.
Host: *Cibotium chamissoi* Kaulf.

Index to changed names and names in current use

This list was compiled from Farr et al. (1989) and from Hansford (1961). Literature citations were obtained from the CMI "Index of Fungi", Petrak's Lists, and Saccardo's "Sylloge Fungorum."

Actinodothis perrottetiae F. Stevens = **Amazonia stevensii** Hansford, emend. Hansford, Sydowia 9: 27, 1955.

Actinodothis suttonia F. stevens = **Amazonia suttoniae** (F. Stevens) Hansford, Sydowia 9: 28, 1955.

Amazonia ohianus F. Stevens = **Asteridiella ohiana** (F. Stevens) Hansford, Beih. Sydowia 2: 138, 1961.

Amazonia perrottetiae F. Stevens = **Asteridiella perrottetiae** (F. Stevens) Hansford, Beih. Sydowia 1: 91, 1957.

Cercospora ageratii F. Stevens = **Mycovellosiella perfoliata** Muntañola, Lilloa 30: 201, 1960.

Cercospora arctii F. Stevens = **Cercospora arctii-ambrosiae** Halsted, Bull. Torrey Bot. Club 20: 251, 1893. *Fide* Solheim & Stevens, Mycologia 23: 393, 1931.

Colletotrichum passiflorae F. Stevens & P. A. Young = **Colletotrichum gloeosporoides** (Penzig) Penzig & Saccardo. *Fide* von Arx, Phytopath. Z. 29: 413-468, 1957.

Dasycypha sadleriae F. Stevens & P. A. Young = **Calycellina sadleriae** (F. Stevens & P. A. Young) Dennis, Kew Bull. 17: 363, 1963.

Echidnodella cocculi F. Stevens & R. Ryan = **Lembosina cocculi** (F. Stevens & R. Ryan) Arx, Beitr. Kryptogammenfl. Schweiz, 11: 121, 1962.

Exioconidium cibotii Plunkett = **Chalara cibotii** (Plunkett) Nag Raj & Kendrick, A Monograph of *Chalara* and allied genera, p. 101, Waterloo, 1975.

Gloeosporium peleae F. Stevens = **Colletotrichum gloeosporoides** (Penzig) Penzig & Saccardo. *Fide* von Arx, Phytopath. Z. 29: 431, 1957.

Irene cheirodendronis F. Stevens = **Asteridiella cheirodendri** (F. Stevens) Hansford, Beih. Sydowia 2: 481, 1961.

Irene cyrtandrae F. Stevens = **Asteridiella cyrtandrae** (F. Stevens) Hansford, Beih. Sydowia 2: 656, 1961.

Irene scaevolicola F. Stevens = **Meliola scaevolicola** (F. Stevens) Hansford, Beih. Sydowia 2: 627, 1961.

Irene splendens F. Stevens = **Appendiculella splendens** (F. Stevens) Hansford, Beih. Sydowia 2: 363, 1961.

Massalongiella canavaliae F. Stevens & P. A. Young = **Enchnoa canavaliae** F. Stevens & P. A. Young nom. nud. *Fide* Farr et al., 1989.

Peltella freycinetiae F. Stevens & R. Ryan = **Myiocopron freycinetiae** (F. Stevens & R. Ryan) G. Arnaud, Ann. Cryptog. Exot. 4: 88. 1931.

Phaeosaccardinula morindae Mendoza = **Limacinula theae** Sydow & Butler, Ann. Mycol. 9: 386, 1911. *Fide* Reynolds, Mycologia 63: 1205, 1971.

Phyllosticta codiaei F. Stevens & P. A. Young = **Phyllosticta ghaesembillae** Koord., Botan. Untersuch. p. 205, 1907.

Pluriporus gouldiae F. Stevens & R. Ryan = **Dothidella rubiacearum** (G. Arnaud) Arx, Acta Bot. Neerl. 7: 506, 1958.

Polystomella kaduae F. Stevens & R. Ryan = **Dothidella kaduae** (F. Stevens & R. Ryan) Arx, Acta Bot. Neerl. 7: 506, 1958.

Schizochora pandani F. Stevens = **Oxydothis pandanicola** (Sydow & P. Sydow) Petrak. *Fide* Farr et al., 1989.

Seynesia atkinsonii F. Stevens & R. Ryan = **Myiocopron freycinetiae** (F. Stevens & R. Ryan) G. Arnaud, Ann. Cryptog. Exot. 4: 88, 1931.

Yoshinagella nuda F. Stevens = **Coccodiella nuda** (F. Stevens) Hino & Katumato, J. Jap. Bot. 43: 282, 1968.

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References

Farr, D. F., G. F. Bills, G. P. Chamuris and A. Y. Rossman. 1989. Fungi on plants and plant products in the United States. APS Press, St. Paul. 1252 pp.

Hansford, C. G. 1961. The Meliolineae. Beih. Sydowia 2: 1-806.

Parris, G. K. 1940. A check list of fungi, bacteria, nematodes and viruses occurring in Hawaii and their hosts. Pl. Dis. Reporter Suppl. 121: 1-21.

Raabe, R. D., I. L. Connors and A. P. Martinez. 1981. Checklist of plant diseases in Hawaii. Hawaii Institute of Tropical Agriculture and Human Resources, College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa, Honolulu. 313 pp.

Stevens, F. L. 1925. Hawaiian Fungi. Bernice P. Bishop Mus. Bull. No. 19. 1-189. (Reprinted by Kraus Reprint Co., New York, NY, 1971.)

MYCOTAXON

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FIRST RECORD OF THE GENUS MICROPSALLIOTA (BASIDIOMYCOTINA, AGARICACEAE) IN MEXICO

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SUMMARY

The genus *Micropsalliota* is reported for the first time to the Mexican mycoflora, through *M. roseovinaceus* Pegler and *M. heinemaniana* Guzmán-Dávalos sp.nov., both from tropical or subtropical areas of Jalisco State, in Mexico.

INTRODUCTION

The species of *Micropsalliota* Höhn. (Agaricales, Agaricaceae) had been considered within *Agaricus* L.:Fr. or *Lepiota* Pers.:S.F.Gray, depending on author's criterion. Pegler & Rayner (1969) emended the genus *Micropsalliota* and separated from *Agaricus*, for their small and slender fruit body, spores communly with an apical thickening of the endosporium and for having cheilocystidia normally capitate. *Micropsalliota* is distinguished from *Lepiota* for their purplish brown to chocolate brown lamellae and their yellowish brown spores (Heinemann, 1977).

In the present work, this genus is cited for the first time to the Mexican mycoflora. *M. roseovinaceus* Pegler and a new species are described macro and microscopically. Examined specimens are deposited in the Herbaria of the Instituto de Botánica, Universidad de Guadalajara (IBUG), Instituto de Ecología, Xalapa, Veracruz (XAL) and Universidad Autónoma del Estado de Morelos (HEMIM).

Collections were made in tropical and subtropical forest in State of Jalisco. Microscopic study was made on dry material, following the standard techniques in mycology. Slides were mounted in 5% KOH or Melzer's reagent.

STUDIED SPECIES

Micropsalliota roseovinaceus Pegler, Kew. Bull. Add. Ser. 9: 457, 1983.

Figs. 1-4.

Pileus 25-37 mm diam., campanulate to plane subumbonate, disk whole, even, the rest fibrillose-squamulose appressed, centre and fibrilles brown purple to dark vinaceous on a yellowish white background, which changes to pinkish vinaceous when dry, margin smooth to striate when dry. Lamellae free, moderately crowded, narrow, chocolate brown with a lighter edge. Stipe 35-40 x 3-5 mm, terete, equal to bulbous, base to 7 mm diam., hollow, cottony fibrillose, whitish, staining vinaceous brown below. Annulus membranous, apical, smooth above, cottony fibrillose below, whitish, dark chocolate brown above due to the spore deposit. Context whitish, changing to iodine color. Rhizomorphs whitish, changing to yellowish. Odour and taste slightly anised.

Spores (4-)4.8-6 x (2.8-)3.2-4 μm, ellipsoid, smooth, without germ pore, subthick wall (0.8 μm), lacking an apical endosporial thickening, yellowish brown to dark brown in KOH. Pleurocystidia none. Cheilocystidia 13.6-30.4 x 2.4-4.4 μm at base, apex 4.8-8.8 μm diam., cylindric to clavate, with the apex inflated to subcapitate, hyaline. Hymenophoral trama subregular. Subhymenium pseudoparenchymatous. Pileus trama interwoven, hyphae 2.8-14.4 μm diam. Pileipellis with hyphae 4.8-8.8 μm diam., prostrate to suberect, septate, terminal elements rounded, sometimes inflated, with reddish brown vacuolar pigment. Clamp connections absent.

HABITAT: Gregarious to caespitous, on rotting wood in tropical deciduos forest.

SPECIMEN EXAMINED: JALISCO, Municipality of Unión de Tula, km 36 Guadalajara-Autlán road, 4 km before El Grullo to Autlán junction, 9 August 1989, J. Toscano 122 (IBUG, HEMIM, XAL).

DISCUSSION: This species is defined by its slender basidiome, for having a fibrillose-squamulose pileus and for its color; spores with a uniform subthick wall, without apical thickening, and cylindric cheilocystidia with an inflated apex are also important features. Another characteristic, not mentioned by Pegler (1983), is the color change in the context and stipe, observed in the Mexican specimen. Furtheremore it has rhizomorphs and a typical odour and taste. Heinemann (1990) considered that this species would be best placed in the genus *Agaricus*, due to the spores without apical thickening and cheilocystidia form. *M. roseovinaceus* was only known from the Lesser Antilles.

Micropsalliota heinemaniana Guzmán-Dávalos, sp. nov.

Figs. 5-10.

Pileus 16-25 mm latus, convexus ad plane-subumbonatus, in juventute squamulosus, deinde fibrillosus appressus, vinaceo-brunneus, in superficie albidus vel cremeus. Lamellae liberae, confertae, angustae vel sublatae, albidae vel crema-brunnea deinde obscurior theobrominae. Stipes 40-74 x 3-4 mm, cylindricus, aequus, fibrilloso-squamosus, albidus vel cremeus, squamae vinaceo-brunnea. Annulus membranaceus, supra medium adnatus. Caro albida. Sporae 5.6-7.2 x 3.2-4 (6.4 x 4) μm, amygdaliformae, apice incrassatae, fulvae. Basidia 20-26.4 x 5.6-7.6 μm, clavata, 4-sporigera. Pleurocystidia 24.8-37.6 x 10.4-14.4 μm, apex 3.2-5.6 μm, ampullacea, capitata. Cheilocystidia 29.6-49.6 x 8-12.8μm, ampullacea, lecitiformis, cylindraceo-clavata, capitata. Caulocystidia 96-112 x 9.6-13.6 μm, apex 8-9.2 μm, cylindraceo-ventricosa, capitata. Ad terram in sylvis. Holotypus: *O. Vargas 439*, prope El Floripondio, Nevado de Colima, in Jalisco, Mexico, in Herb. IBUG conservatus est.

Pileus 16-25 mm diam., convex to plane, subumbonate, squamulose when young to fibrillose appressed when mature, dark reddish-vinaceous brown on the centre and fibrilles on a whitish to cream background, that changes to pinkish vinaceous when dry, margin smooth, sometimes cracked. Lamellae free, moderately crowded, narrow to sub-broad, white to cream brown, finally dark chocolate brown, edge concolours, smooth. Stipe 40-74 x 3-4 mm, terete, equal, hollow, fibrillose-squamose, whitish to cream, pinkish vinaceous when dry, scales concolours with the ornamentation of the pileus. Annulus membranous, apical, vanishing, whitish to light reddish brown, finally dark pinkish vinaceous when dry. Context whitish, pinkish vinaceous when dry. Odour pleasant. KOH pileus red, stipe blackish brown, context reddish brown.

Spores 5.6-7.2 x 3.2-4 (6.4 x 4) μm, amygdaliform, smooth, without germ pore, subthick wall (0.8 μm), with an apical endosporium thickening, yellowish brown in KOH. Basidia 20-26.4 x 5.6-7.6 μm, sterigmata 2.4-4 μm, clavate, tetraspored, hyaline to yellowish. Pleurocystidia 24.8-37.6 x 10.4-14.4 μm, apex 3.2-5.6 μm diam., conspicuous, flask-shapped to lecitiform, capitate or not, hyaline to yellowish. Cheilocystidia 29.6-49.6 x 8-12.8 μm, apex 3.2-6.4 μm, flask-shapped, lecitiform or cylindric clavate, with or without a long neck, capitate or not, rare ventricose rostrate, hyaline to yellowish, some with a grayish yellow vacuolar pigment. Hymenophoral trama subregular, with hyaline hyphae. Subhymenium pseudoparenchymatous, cells with a reddish vacuolar pigment. Pileus trama interwoven, hyphae 4-14.4 μm diam., hyaline to yellowish. Pileipellis with hyphae 4-12 μm diam., prostrate, septate, with yellowish brown encrusted pigment. Caulocystidia 96-112 x 9.6-13.6 μm, apex 8-9.2 μm diam., cylindric ventricose, some flask-shapped with a long neck, capitate or subcapitate, yellowish or with an olive brown content, rare, only present in the stipe apex, elswhere bearing tufts of hyphae that form the scales, hyphae 4-20.8 μm diam., septate, apex rounded but not inflated, thin walled, concolours with the caulocystidia. Clamp connections absent. Sections liberate a vinaceous red pigment in water or grayish brown in KOH.

HABITAT: Gregarious, on humus in mesophytic forest.

SPECIMEN EXAMINED: JALISCO, Municipality of Ciudad Guzmán, Nevado de Colima slope, El Floripondio, O. Vargas 439, 11 August 1990 (IBUG, holotype; XAL, isotype).

DISCUSSION: Usually *Micropsalliota* lacks pleurocystidia, as it was mentioned by Singer (1986). The few pleurocystidia's described species, like *M. xanthorubescens* Heinem., *M. pleurocystidiata* Heinem. & Little Flower and *M. cystidiosa* Natarajan & Manjula, do not agree with the Mexican material. The first one is distinguished by its pileus hirsute squamulose, fuscus brown and lanceolate pleurocystidia (Heinemann, 1980). *M. pleurocystidiata* has a white pileus with brown squamules, spores 4.8-5.9 x 3.1-3.6 μm and subcapitate lageniform pleurocystidia (Heinemann & Little Flower, 1983) and *M. cystidiosa* is characterized by brown fibrillose scales on a brown pileus too and fusoid ventricose pleurocystidia (Natajaran & Manjula, 1982). Furthermore, Heinemann (1989) described *M. pruinosa* Heinem. with pleurocystidia "rares ou nulles" and Heinemann and Leelavathy (1991) described *M. pudica* Heinem. & Leelavathy with pleurocystidia absent, "except perhaps near the lamella-edge".

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LITERATURE CITED

Heinemann, P., 1977. The genus *Micropsalliota* . Kew Bull. 31: 581-583.

Heinemann, P., 1980. Les genres *Agaricus* et *Micropsalliota* en Malaisie et en Indonésie. Bull. Jard. Bot. Nat. Belg. 50: 3-68.

Heinemann, P., 1989. Le genre *Micropsalliota* en Amérique tropicale subtropicale. Bull. Jard. Bot. Nat. Belg. 59: 459-466.

Heinemann, P., 1990. Le genre *Micropsalliota* (Agaricaceae). Bull. Soc. Myc. Fr. 106: 1-30.

Heinemann, P. & Sr. Little Flower, 1983. *Micropsalliota* de Kerala (Inde). Bull. Jard. Bot. Nat. Belg. 53: 75-84.

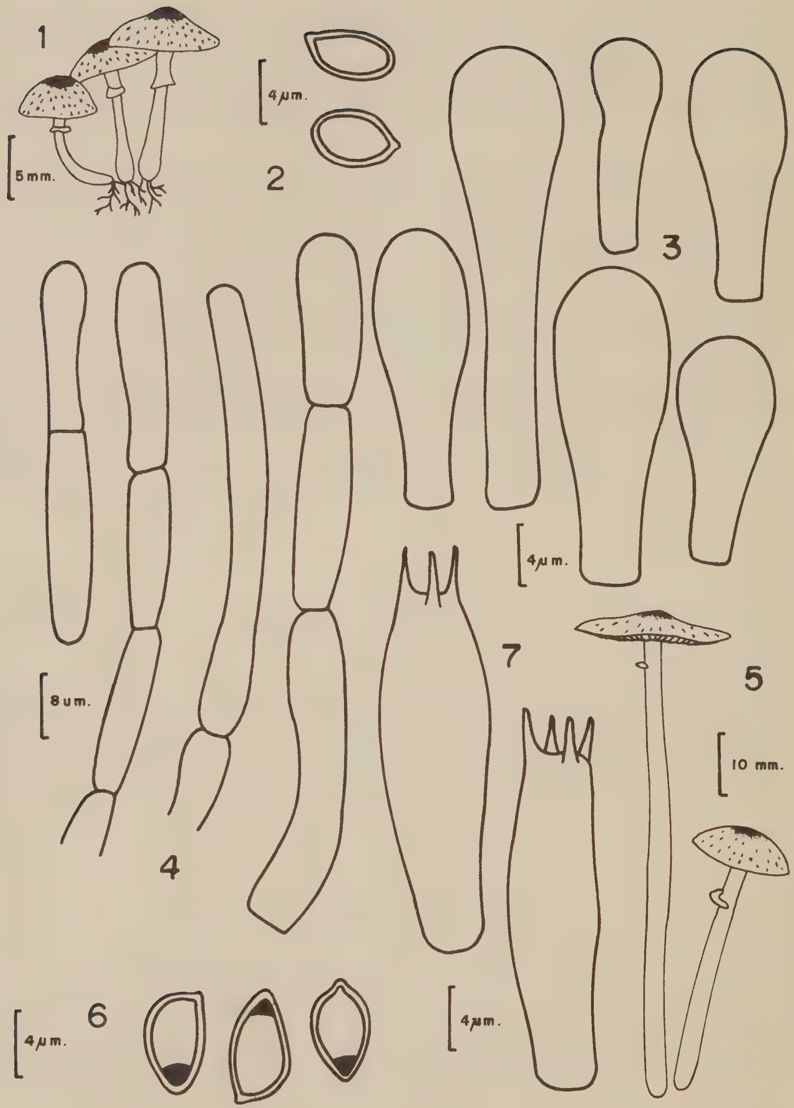
Heinemann, P. & K.M. Leelavathy, 1991. The genus *Micropsalliota* (Agaricaceae) in Kerala State, India. Mycol. Res. 95(3): 341-346.

Natarajan, K. & B.Manjula, 1982. South Indian Agaricales-XI. Mycologia 74: 130-137.

Pegler, D.N., 1983. Agaric Flora of the Lesser Antilles. Kew Bull. Add. Ser. IX & Her Maj. St. Off., London.

Pegler, D.N. & R.W.Rayner, 1969. A contribution to the Agaric Flora of Kenya. Kew Bull. 23: 347-412.

Singer, R., 1986. The Agaricales in Modern Taxonomy. Koeltz Scient. Books, Koenigstein.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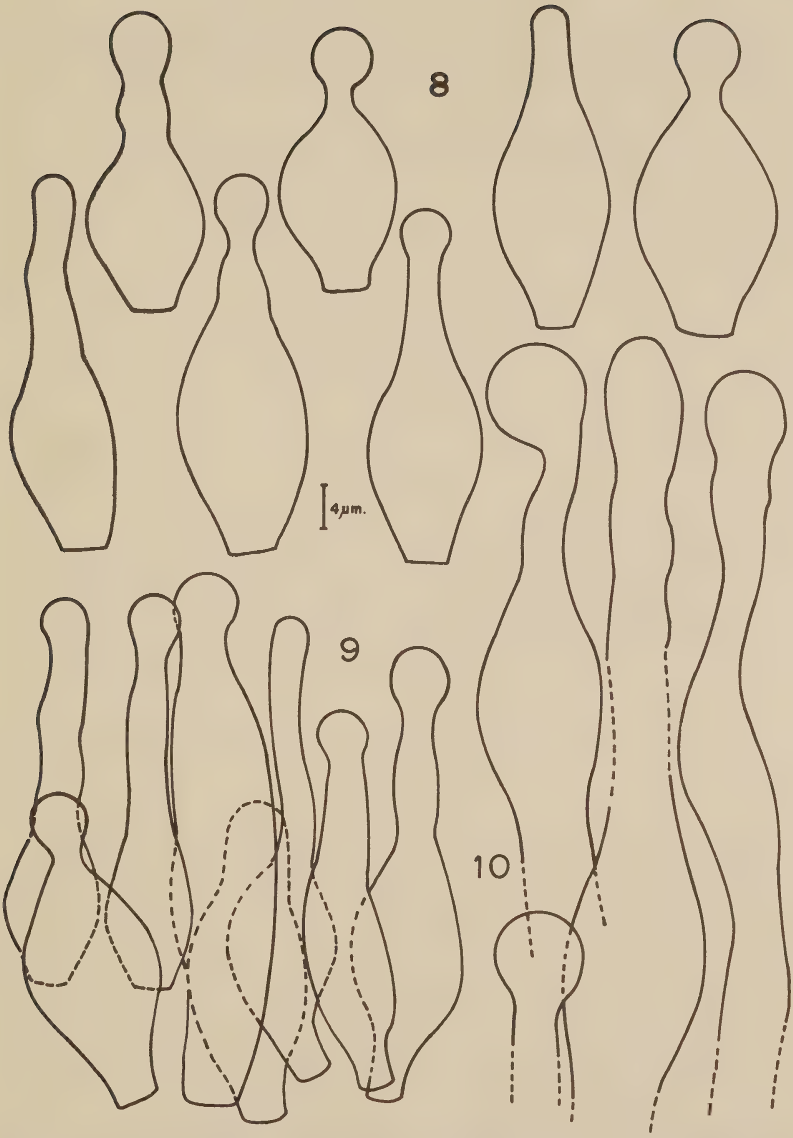
Figs. 1-7. 1-4: *Micropsalliota roseovinaceus* (Toscano 122), 1: basidiocarp, 2: spores, 3: cheilocystidia, 4: hyphae from pileipellis. 5-7: *Micropsalliota heinemaniana* (Vargas 439), 5: basidiocarp, 6: spores, 7: basidia.



Figs. 8-10: *Micropsalliota heinemaniana* (Vargas 439), 8: pleurocystidia, 9: cheilocystidia,10: caulocystidia.

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INDEX TO GENERA AND SPECIES OF ASCOMYCETES DESCRIBED BY A. P. VIÉGAS

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ABSTRACT

An examination of 51 publications by the Brazilian mycologist A. P. Viégas revealed that 20 of them contained descriptions of tropical ascomycetes. Included among these are several new genera and species. In order to make these papers more useful to mycologists, an index to ascomycetes and their anamorphs discussed in them has been prepared, along with a host index.

Keywords: Ascomycotina, Brazil, tropical ascomycetes.

INTRODUCTION

Throughout his long and distinguished career, extending from the late 1930's through the 1970's, the Brazilian mycologist Ahmés Pinto Viégas was a prolific contributor to the literature on tropical fungi. Although he is perhaps best known for his "Indice de Fungos da América do Sul" (16) and the "Dicionário de Fitopatologia e Micologia" (17), he collected and described many species of Brazilian fungi from each of the major classes. His primary emphasis, however, was on the ascomycetes, and his "Alguns Fungos do Brasil. II. Ascomicetos" (7), containing descriptions of 317 species, remains the best single-volume treatment of the tropical representatives of this group, even though it was published half a century ago. Viégas' combined publications remain the most extensive list of fungi for South America, and his host index is the only one for the area. Nearly all of the species are described in detail and most are well illustrated by line drawings. Taxonomically, Viégas' papers are important because they contain the original descriptions of at least 13 new genera, 90 new species, four new combinations, and one new name in the ascomycetes.

One deterrent to using Viégas' work has been the lack of an index to taxa. Of 51 publications reviewed, 20 contained descriptions of ascomycetes (1-20). Consequently, an index to the genera and species of ascomycetes and their anamorphs referred to in these 20 papers has been prepared. These binomials are listed alphabetically in the "Index to Fungal Genera and Species". New taxa described by Viégas are printed in boldface, as is the reference containing the new description. This is followed by a "Host and Substrate Index" that lists alphabetically the substrates and binomials of hosts and gives the fungus occurring on each. In both lists the underlined number refers to the number of the paper in the "Literature Cited"; the page number(s) on which the fungus is mentioned is given for the fungal index. Page numbers containing illustrations are designated by an asterisk (*), or in the case of plates, by (pl.), followed by the plate number.

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  - *Crauatamyces eupatorii* - 7
  - *Hypocrella caulium* - 7
  - *Whetzeliomyces niger* - 11
- *Euphorbia comosa* Vell. - 7
  - *Oidium* sp.
- *Euphorbia prunifolia* (Jacq.) Muell.-Arg. var. *repanda* Muell.-Arg. - 7
  - *Oidium* sp.
- Euphorbiaceae - 7
  - *Parodiopsis perae*

- *Ficus carica* L. - 7
  - *Rosellinia* sp.
- *Ficus doliaria* Mart. - 7
  - *Catacauma decaisneanum*
- *Ficus laeta* Decne. - 7
  - *Catacauma decaisneanum*
- *Fimbrystis capillaris* (L.) A. Gray - 7
  - *Catacauma gracillimum*
- *Fortunella* sp. - 7
  - *Elsinoe australis*
- *Fragaria vesca* L. - 7
  - *Mycosphaerella fragariae*

- *Galactea speciosa* (DC.) Britton - 7
  - *Endodothella galacteae*
- *Galinsoga parviflora* Cav. - 7
  - *Oidium* sp.
- *Gleichenia pectinata* Willd. - 7

  - *Dasyscyphus ulei*
- *Glycine max* Merr. - 7
  - *Oidium* sp.
- *Gossypium hirsutum* L. - 7
  - *Rosellinia* sp.
- *Gouania virgata* Riess. - 9
  - *Catacauma gouaniae*
- Gramineae - 7
  - *Kiehlia obscura*
- *Guadua* sp. - 7
  - *Balansia regularis*
  - *Hypocrella fluminensis*
  - *Hypocrella* sp.
  - *Kretzschmariella guaduae*
  - *Nectria* sp.
  - *Pariodiopsis pilosa*
  - *Urupe guaduae*
- *Guarea tuberculata* Vell. - 7
  - *Hypocrella cornuta*
  - *Hypocrella* sp.
- *Guarea* sp. - 7
  - *Meliola* sp.

- Hair, human - 2; 7
  - *Piedraia hortai*
- *Hedera helix* L. - 7
  - *Physalospora* sp.
- *Hevea brasiliensis* (Willd. ex Adr. Juss.) Müll. Arg. - 7
  - *Dothidella ulei*
- *Hevea* sp. - 7; 9
  - *Catacauma huberi* - 9
  - *Dothidella ulei* - 7
  - *Phyllachora huberi* - 9
- *Hibiscus esculentus* L. - 7
  - *Oidium* sp.
- *Hibiscus sabdariffa* L. - 7
  - *Oidium* sp.
- *Homo sapiens* L. - 7
  - *Chaetomium indicum*
  - *Sporormia articulata*
- Humus - 7
  - *Thamnomyces chamissonis*
- *Hydrangea* sp. - 7
  - *Oidium* sp.
- *Hypoxis decumbens* L. var. *major* Seub. - 7
  - *Capnodium brasiliense*

- *Ilex* sp. - 7
  - *Dimerosporium* sp.
- *Imperata brasiliensis* Trin. - 7
  - *Phyllachora antioguensis*
- *Indigofera anil* L. - 7
  - *Parodiella spegazzinnii* var. *kilimandscharica*
- *Inga* sp. - 7; 14
  - *Catacauma ingae* - 14
  - *Perisporina roupalae* - 7
  - *Xylaria ianthino-velutina* - 7
- Insect, aleyrodid - 7
  - *Capnodium hirta*
  - *Hypocrella aleyrodes*
  - *H. cornuta*
  - *H. fluminensis*
  - *H. libera*
- Insect, coccid - 7
  - *Hypocrella* sp.
  - *H. phyllogena*
  - *Myriangium argentinum*
  - *M. floridanum*
- Insect, coleoptera - 7
  - *Cordyceps volkiana*
- Insect, diptera - 7
  - *Cordyceps* sp.
- Insect - 7
  - *Cordyceps polyarthra*
  - *Cordyceps* sp.
  - *Hypocrella* sp.
  - *H. albida*
  - *H. caulium*
  - *H. cavernosa*
  - *H. hypoxylon*
  - *H. libera*
  - *H. phyllogena*
  - *H. semiamplexa*
  - *H. verruculosa*
- *Ipomoea batatas* Lam. - 7

Elsinoe batatas
Ipomoea biloba Forsk - 7
Meliola olavulata

Jatropha curcas L. - 7
Glomerella cingulata
Justicia sp. - 7
Dothideovalsa tucumanensis

Lagenaria sp. - 7
Polyrhizon sp.
Lantana camara L. - 7
Meliola sp.
Lasiacis ligulata Hitch. & Chase - 7
Dothichloe subnodosa
Lasiacis sp. - 7
Nectria sp.
Lauraceae - 7
Coccostroma puttemannsii
Laurus sp. - 7
Stomiopeltis aspersa
Leguminosae - 7
Stigmachora controversa
Lepidosaphis beckii Newma - 7
Myriangium floridanum
Lepidosaphis sp. - 7
Myriangium floridanum
Podonectria coccicola
Lithraea sp. - 3; 7
Meliola lanigera

Mabea fistulifera Mart. - 7
Parodiopsis melioloides
Machaerium angustifolium Vog. - 7
Pseudothis subcoccodes
Machaerium lanatum Tul. - 7
Pseudothis subcoccodes
Machaerium nigrum Vog. - 7
Catacauma hammari
Machaerium secundiflorum Mart. - 13
Coccostroma machaeri
Machaerium stipitatum Vog. - 7
Pseudothis subcoccodes
Machaerium sp. - 7
Catacauma hammari
Malpigiaceae - 7
Catacauma caracense
Malvastrum coromandelianum Grcke. - 7
Brasiliomyces malachrae
Mangifera indica L.- 7
Oidium anacardii
Manihot ultilissima Pohl - 7
Diaporthe manihoticola
Dictyostomiopelta manihoticola
Eutypella manihoticola
Microthyrium manihoticulum
Oidium manihotis
Pleophragmia manihoticola
Rosellinia sp.
Manihot sp. - 7
Diaporthe manihoticola
Oidium manihotis Rosellinia sp.
Mascagnia sp. - 13
Munkiella mascagniae
Medicago sativa L. - 7
Pseudoplea briosiana
Melastomaceae - 7; 9
Dermatea parasitica - 7
Dictyodothis melastomacearum - 9
Melia azedarach L. - 7
Oidium sp.
Meliola sp. - 7
Stigme placostroma
Miconia albicans Triana - 11
Lasiosphaeria miconiae
Miconia rubiginosa DC. - 7
Bagnisiopsis peribebuyensis
Catacaumella miconiae
Miconia sp. - 7
Catacaumella miconiae
Microstachys sp. - 7
Myriogenospora paspali
Mikania hirsutissima DC. - 7
Maireella bertioides

- *Mikania microlepis* Baker - 7
  - *Maireella bertioides*
- *Mikania sericea* Hook. & Arn. - 7
  - *Maireella bertioides*
- *Mikania* sp. - 7
  - *Dermatadothella multiseptata*
  - *Maireella bertioides*
- *Mimosa pudica* L. - 7
  - *Nectria* sp.
- *Mimosa velloziana* Mart. - 8
  - *Elsinoe purpurascens*
- *Mimosa* sp. - 7; 19
  - *Elsinoe* sp.
  - *E. mimosae*
- *Moquilea utilis* Hook. - 12
  - *Bagnisiopsis moquileae* - 12
- *Morus* sp. - 7
  - *Diatrype* sp.
  - *Diatrypella amorae*
  - *Myriangium floridanum*
- *Musa cavendishii* Lamb. - 7
  - *Rosellinia* sp.
- *Musa sapientum* L. - 1; 7
  - *Chaetothyrium musarum* - 7
  - *Rosellinia bunodes* - 1
- *Musa* sp. - 7
  - *Capnodium musae*
  - *Nectria* sp.
- *Musca* sp. - 7
  - *Cordyceps muscicola*
- *Myrcia rostrata* DC. - 7
  - *Phyllachora myrcia-rostratae*
- *Myrcia vestita* DC. - 7
  - *Catacauma myrciae*
- Myrtaceae - 4; 7; 10
  - *Antennela* sp. - 7
  - *Capnodium hirta* - 7
  - *Catacauma biguttulatum* - 7
  - *C. myrciae* - 7
  - *C. nigerrimum* - 7
  - *C. subcircinans* - 7
  - *C. truncatisporum* - 7
  - *Episphaerella myrciae* - 7
  - *Polyrhizon* sp. - 7
  - *Pseudothis myrtacearum* - 10
  - *Trabutia pampulhae* - 7
  - *Tolediella fusispora* - 4; 7

- *Nectandra nitidula* Nees & Mart. - 7
  - *Coccostroma puttemansii*
- *Nectandra* sp. - 7; 13
  - *Coccostroma puttemansii* - 7
  - *Hypocrella andropogonis* - 7
  - *Phyllachora lauracearum* - 13
- *Nicotiana tabacum* L. - 7
  - *Ceratostomella fimbriata*
- *Nymphaea* sp. - 7
  - *Nectria* sp.

- *Oleandra* sp. - 7
  - *Hypocrella hypoxylon*
- *Olyra micrantha* H.B.K. - 7
  - *Urupe guaduae*
- *Olyra* sp. - 7
  - *Hypocrella verruculosa*
- *Oplismenus* sp. - 20
  - *Montagnella* sp.
- *Oplismenus hirtellus* (L.) Beauv. - 20
  - *Montagnella* sp.
- *Oplismenus setarius* (Lam.) Roem. & Schult. - 20
  - *Montagnella puiggari*
- *Opuntia ficus-indica* (L.) Mill. - 7
  - *Montagnella opuntiarum*
- *Oryza sativa* L. - 7
  - *Leptosphaeria* sp.
- *Oxalis* sp. - 7
  - *Capnodium brasiliensis*

- Palmae - 7
  - *Hypocrella* sp.
  - *H. cornuta*
- *Pandorea ricasoliana* Baill. - 7
  - *Capnodium* sp.
- *Panicum frondescens* Meyer - 7
  - *Aulographella brasiliensis*

Panicum pilosum Sw. - 7
Dothichloe subnodosa
Panicum sp. - 7
Myriogenospora paspali
Paspalum conspersum Schrad. - 7
Phyllachora acuminata
Paspalum mandiocanum Trin. - 7
Capnodium brasiliense
Paspalum schaffneri Griseb. - 7
Dothichloe nigricans
Paspalum sp. - 7
Phyllachora acuminata
Paullinia elegans Cam. - 7
Meliola sapindacearum
Persea americana Mill. - 7
Fracchiaea heterogenea
Persea gratissima Gaertn. - 7
Oidium sp.
Persea sp. - 7
Oidium sp.
Stomiopeltis aspersa
Petastoma formosum Bur. - 7
Elsinoe caroli
Phaseolus vulgaris L. - 7
Oidium sp.
Phaseolus sp. - 7
Oidium sp.
Piper sp. - 7
Hypocrella andropogonis
Hypocrella sp.
Muricopeltis brasiliensis
Polystomella piperis
Piptadenia communis Benth. - 7
Tryblidiella rufula
Pisum sativum L. - 7
Oidium sp.
Pithecolobium sp. - 7
Stigmachora controversa
Plant, unidentified - 7; 8; 11; 12; 13; 14
Acanthostigma cantareirense - 12
Botryosphaeria costai - 7
Capnodium sp. - 8
Capnodium brasiliense - 7
Diatrype sp. - 7
Elsinoe sp. - 7
Erysiphe sp. - 7
Helotium sp. - 7
Hypocrella sp. - 7
H. albida - 7
H. andropogonis - 7
H. libera - 7
H. ochracea - 7
H. phyllogena - 7
Kretzschmaria clavus - 7
K. lichenoides - 11
Mycosphaerella sp. - 7
Neopeckia brasiliana - 12
Nummularia artocreas - 14
N. ubatubensis - 13
Oidium sp. - 7
Parodiopsis concentrica - 7
Phyllachora tamoyae - 7
Phyllachora sp. - 7
Rosellinia sp. - 7
R. bunodes - 7
Setella xyphopaga - 7
Trichoscypha tricholoma - 7
Xylaria euglossa - 7
Plantago sp. - 7
Phaeosphaeria sp.
Platycyamus regnellii Benth. - 18
Queirozia turbinata
Podocarpus lambertii Klotzch. - 7
Corynelia brasiliensis
Podocarpus sp. - 7
Corynelia brasiliensis
Prunus domestica L. - 7
Mycosphaerella sentina
Prunus persica Sieb. & Zucc. - 7
Taphrina deformans
Psidium guajava L. - 7
Meliola psidii
Psidium sp. - 7
Catacauma subcircinans
Pteris aquilina L. - 7
Catacauma rhopographioides

- *Pteris* sp. - 7
  - *Taphrina pteridis*
- *Puccinia purpurea* Cooke - 7
  - *Eudarluca australis*
- *Pyrus communis* L. - 7
  - *Megalonectria irregularia*
- *Pyrus malus* L. - 7
  - *Mycosphaerella sentina*
  - *Nectria* sp.
  - *Tryblidiella rufula*
- *Pyrus* sp. - 7
  - *Physalospora rhodina*

- *Qualea* sp. - 7
  - *Catacauma qualeae*
- *Quebrachia* sp. - 7
  - *Pseudothis subcoccodes*
- *Quercus* sp. - 7
  - *Oidium* sp.

- *Ricinus communis* L. - 7
  - *Ceratostomella fimbriata*
  - *Glomerella* sp.
  - *Pleospora* sp.
  - *Sclerotinia ricini*
- *Rosa* sp. - 7
  - *Actinonema rosae*
  - *Diatrype* sp.
  - *Mycosphaerella rosigena*
  - *Physalospora* sp.
  - *Sphaerotheca pannosa*
- *Roupala tomentosa* Pohl var. *sellowii* Meiss. - 7
  - *Catacauma rhopalinum*
- *Roupala* sp. - 7; 8; 9
  - *Asterinella puiggari* - 8
  - *Catacauma rhopalinum* - 7
  - *Perisporina roupalae* - 7
  - *Trabutia roupalae* - 9
- Rubiaceae - 7
  - *Dothidella clavispora*

- *Saccharum officinarum* L. - 7
  - *Leptosphaeria sacchari*
- *Saccharum spontaneum* L. - 7
  - *Leptosphaeria sacchari*
- *Saccharum* sp. - 7
  - *Leptosphaeria sacchari*
  - *Myriogenospora paspali*
- *Salix* sp. - 7
  - *Diatrypella exigua*
  - *Physalospora* sp.
- Sapindaceae - 7
  - *Meliola sapindacearum*
- *Sapindus saponaria* L. - 7
  - *Meliola sapindacearum*
- *Schizolobium excelsum* Vogel - 7
  - *Physalospora* sp.
- *Schizolobium* sp. - 7
  - *Fracchiaea heterogenea*
- *Senecio brasiliensis* Less. - 7
  - *Hypocrella caulium*
- *Serjania lamprophyla* Radlk. - 7
  - *Catacauma serjaniae*
- *Serjania* sp. - 5; 7
  - *Catacauma serjaniae* - 7
  - *Haplodothis serjaniae* - 7
  - *Meliola sapindacearum* - 7
  - *Stalagmites tumefaciens* - 5; 7
- *Sida linifolia* Cav. - 7
  - *Oidium* sp.
- Skin, human - 6
  - *Sporormia articulata*
- *Solanum auriculatum* Ait. - 7
  - *Oidium* sp.
- *Solanum tuberosum* L. - 7
  - *Mycosphaerella* sp.
  - *Rosellinia* sp.
- *Solanum* sp. - 7
  - *Calospora solani*
  - *Meliola bicornis*
- *Sorghum* sp. - 7
  - *Eudarluca australis*
- *Spondias lutea* L. - 13
  - *Roesleria brasiliana*
- *Sporobolus indicus* (L.) L. - 7
  - *Dothichloe limitata*
- *Styrax nervosum* DC. - 7

Schneepia arechavaletae
Styrax sp. - 3; 7
Schneepia arechavaletae

Tabebuia leucoxyla DC. - 7
Phyllachora sordida
Tapirira sp. - 9
Phyllachora tapirirae
Tecoma araliaceae DC. - 3
Apiosphaeria guaranitica
Tecoma chrysantha Nichools - 3
Apiosphaeria guaranitica
Tecoma grandiceps Krãnzl. - 15
Uncinula peruviana
Tecoma ipe Mart. - 15
Uncinula peruviana
Tecoma longiflora Griseb. - 3
Apiosphaeria guaranitica
Tecoma serratifolia (Vahl) G. Don - 7
Apiosphaeria guaranitica
Tecoma sp. - 7; 15
Apiosphaeria guaranitica - 7
Elsinoe tecomae - 7
Mycosphaerella tecomae - 7
Oidium sp. - 7
Uncinula peruviana - 15
Tephrosia candida DC. - 7
Stomiopeltis tephrosiae
Theobroma cacao L. - 7
Nectria sp.
Thielodoxa lanceolata Cham. - 7
Dothidella clavispora
Tibouchina holoserica Baill. - 7
Bagnisiopsis tijucensis
Tibouchina scaberrima Congn. - 7
Xylaria sp.
Tibouchina sp. - 7
Felisbertia melastomacearum
Trattinickia sp. - 12
Coccostroma trattinickiae
Triticum aestivum L. - 7
Oidium monilioides
Triticum sp. - 7
Oidium monilioides
Typha dominquensis Kunth - 7
Hypocrella sp.

Urena sp. - 7
Oidium sp.
Urtica sp. - 1; 7
Rosellinia sp. -7
R. bunodes - 1; 7

Verbena bonariensis L. - 7
Oidium sp.
Elsinoe verbenae
Vernonia polyanthes Less - 7
Elsinoe boehmeriae
Uncinula vernoniae
Vitis sp. - 7
Elsinoe ampelina
Oidium tuckeri
Stomiopeltis sp.

Wall - 7
Pyronema domestica
Wissadula amplissima (L.) Fries - 7
Oidiopsis wissandulae
Wissadula sp. - 7
Oidiopsis wissandulae
Wood, decayed - 7; 10; 11
Byssonectria dichotoma - 7
Camillea bilabiata - 7
C. globosa - 7
C. turbinata - 7
Cookeina sulcipes - 7
Chlorosplenium aeruginosum - 7
Daldinia concentrica - 7
Dermatea heteromera - 7
Entonema liquescens - 7
Erinella sp. - 7
Eutypella sp. - 7
Helotium sp. - 7
Hypoxylina fusco-areolata - 7
H. annulatum - 7

Hypoxylon sp. - 7
Kretzschmaria clavus - 7
K. spinifera - 11
Stilbocrea jenkiana - 7
Tryblidiella rufula - 7
Tryblidium goyazense - 7
Valsa sp. - 7
V. longirostrata - 7
Xylaria sp. - 7
X. apiculata - 7
X. dealbata - 7
X. grammica - 10
X. involuta - 7
X. multiplex - 7
X. obovata - 7
X. plebeja - 7
X. rhopaloides - 10

Xanthium spinosum L. - 7
Oidium sp.
Xylopia grandiflora St. Hil. - 7
Phyllachora xylopiae

Zea mays L. - 7; 13
Aspergillus ruber - 13
Leptosphaeria sp. - 7
Zinnia elegans Jacq. - 7
Oidium sp.
Zornia diphylla (L.) Pers. - 7
Parodiella perisporioides 7

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The assistance of David Bartholomew in computerizing these data is much appreciated. I wish to thank Amy Rossman and Gary Samuels for their helpful suggestions and careful review of this manuscript. This project was supported in part by funds from NSF Grant INT-8902172.

LITERATURE CITED

1. Viégas, A. P. 1939. A ocorrência de *Rosellinia bunodes* em Ubatuba, Estado de S. Paulo. J. Agron. (São Paulo) 2:327-331.
2. Viégas, A. P. 1943. Notas sôbre três fungos brasileiros. Bragantia 3:31-48.
3. Viégas, A. P. 1943. Alguns fungos do cerrado. Bragantia 3:49-72.
4. Viégas, A. P. 1943. *Tolediella* nov. gên. da família Phyllachoraceae. Bragantia 3:123-130.
5. Viégas, A. P. 1943. *Stalagmites tumefaciens* (Sydow) Theissen e Sydow. Bragantia 3:133-136.
6. Viégas, A. P. 1943. Notas sôbre uma nova espécie de *Sporormia*. Bragantia 3:155-164.
7. Viégas, A. P. 1944. Alguns fungos do Brasil II. Ascomicetos. Bragantia 4:1-392.
8. Viégas, A. P. 1944. Quatro fungos brasileiros. Rev. Agron. 7:59-70.
9. Viégas, A. P. 1944. Alguns fungos esparsos brasileiros. Rev. Agron. 7:367-383 + 17 plates.

10. Viégas, A. P. 1945. Fungi aliquot brasilensis. Bol. Soc. Bras. Agron. 8:161-173 + 15 plates.
11. Viégas, A. P. 1945. Uns poucos fungos de Brasil. Bragantia 5:561-582.
12. Viégas, A. P. 1946. Quatro ascomicetos novos brasileiros. Bol. Soc. Bras. Agron. 9:1-4 + 4 plates.
13. Viégas, A. P. 1947. Alguns micetos brasileiros. Bragantia 7:25-48.
14. Viégas, A. P. 1947. Alguns fungos encontrados em S. Paulo, Minas e Espírito Santo. Bragantia 7:107-124.
15. Viégas, A. P. 1960. Cinza do ipé. Bragantia 19:141-145.
16. Viégas, A. P. 1961. Indice de Fungos da América do Sul. Inst. Agron., Campinas. 921 pp.
17. Viégas, A. P. 1979. Dicionário de Fitopatologia e Micologia. Editora "Ave Maria" Ltda., São Paulo. 882 pp.
18. Viégas, A. P., and Luiza Cardoso. 1944. *Queirozia*, novo género da família Erysiphaceae. Bol. Soc. Bras. Agron.7:1-6 + 1 plate.
19. Viégas, A. P., and H. P. Krug. 1939. Desenvolvimento de uma espécie de *Elsinoe*. J. Agron. (São Paulo) 2:277-284 + 4 plates.
20. Viégas, A. P., and Cyro G. Teixeira. 1945. Algun fungos de Minas Gerais. Rodriguesia 9:49-56 + 6 plates.

MYCOTAXON

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NEW OR INTERESTING MICROFUNGI

XVI. HYPHOMYCETES FROM THE BRITISH ISLES

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SUMMARY

One new species, *Cacumisporium spooneri* P.M. Kirk, and new British records of *Chaetopsina fulva* and *Gyrothrix verticiclada* are reported.

TAXONOMY

CACUMISPORIUM SPOONERI P.M. Kirk, sp. nov. (Fig. 1)
Etym.: named for Dr Brian M. Spooner.

Coloniae effusae, pilosae, atrobrunneae, plerumque inconspicuosae. Mycelium plerumque in substrato immersum, ex hyphis laevibus, ramosis, septatis, pallide brunneis ad brunneis, 2.5–3.5 um latis compositum. Conidiophora macronematosa, mononematosa, simplicia, solitaria, erecta, recta vel leviter flexuosa, pallide brunnea ad brunnea, ad apicem pallidiora, laevia, septata, 200–250 um alta, 4.0–5.0 um lata, ad fundamentum inflata usque ad 12.0 um lata, per usque ad 5 proliferationes percurrentes. Cellulae conidiogenae in conidiophoris incorporatae, terminales, percurrentes. Conidiorum initium holoblasticum murificationem per apicalem. Conidiorum maturatio initio synchrona. Conidiorum secessio schizolytica. Proliferatio enteroblastica et percurrens, progressiva et annulos fingens. Conidia acrogena, solitaria, ellipsoidea ad leniter fusiformia, ad fundamentum truncata, laevia, atrobrunnea, 7-septata, 26–32 um longa, (3.0–) 4.0 (–5.0) um lata, ad fundamentum 1.5–2.0 um lata.

In cortici emortui arboris ignotae, U.K., Middlesex, Shepperton, Littleton Lakes, 8 Nov. 1987, B.M. Spooner, K, holotypus; IMI 348851, isotypus.

Colonies effuse, hairy, dark brown, usually inconspicuous. *Mycelium* mostly immersed in the substratum, composed of smooth, branched, septate, pale brown to brown hyphae 2.5–3.5 um wide. *Conidiophores* macronematous, mononematous, simple, solitary, erect, straight or slightly flexuous, pale brown to brown, paler towards the apex, smooth, septate, 200–250 um high, 4.0–5.0 um wide, up to 12 um wide at the swollen base, with up to 5 percurrent proliferations at the apex. *Conidiogenous cells* integrated, terminal, percurrent. *Conidial ontogeny* holoblastic by apical wall building. *Conidial maturation* synchronous with conidial ontogeny. *Conidial secession* schizolytic. *Proliferation* enteroblastic percurrent and progressive leading to the formation of annellations. *Conidia* acrogenous, solitary, narrowly ellipsoid to somewhat fusiform, truncate at the base, smooth, dark brown, 7-septate, 26–32 um long, (3.0–) 4.0 (–5.0) um wide, 1.5–2.0 um wide at the base.

Distribution: U.K., known only from the type collection.

A review of the recent history of *Cacumisporium capitulatum* (Corda) S. Hughes (Hughes, 1958) was presented by Sutton (1973) who confirmed the previously tentative synonymy of *Cacumisporium tenebrosum* Preuss, 1851 (the holotype of the genus *Cacumisporium* Preuss) with *Helmisporium capitulatum* Corda, 1838 and resolved the earlier confusion between this taxon and *Pleurothecium recurvatum* (Morgan) Höhnel (Syn. *Acrothecium recurvatum* Morgan, 1895). Only one other name has been referred to *Cacumisporium*: *C. sigmoideum* Mercado Sierra & Castañeda Ruiz (1987). This taxon is clearly unrelated to *C. capitulatum*, because proliferation of the conidiogenous locus appears, from the illustrations accompanying the description, to be sympodial.

The present species differs from the type and only accepted species by its larger and regularly 7-septate conidia.

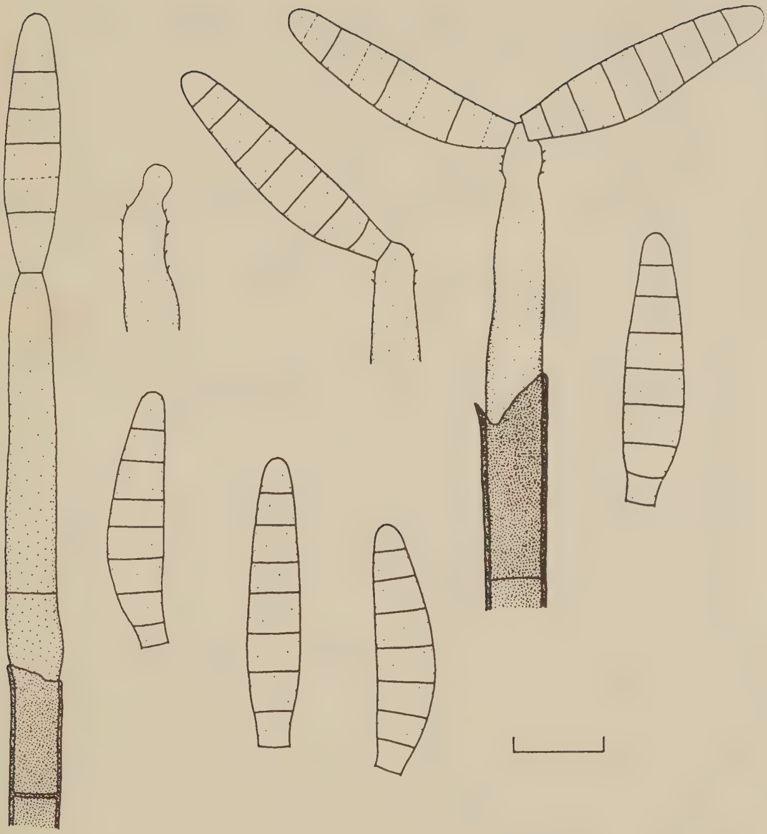

Fig. 1 *Cacumisporium spooneri*, conidiophores and conidia (from type). (bar = 10 um)

CHAETOPSINA FULVA Rambelli, *Atti Accad. Sci. Inst. Bologna Rc.*, ser. XI, **3**: 195 (1956).
Chaetopsina romantica Rambelli & Lunghini, *Trans. Br. mycol. Soc.* **72**: 491 (1979).
Chaetopsis romantica (Rambelli & Lunghini) DiCosmo, Berch & W. Kendrick, *Mycologia* **75**: 968 (1983).
Teleomorph: cf. *Nectria chaetopsinae* Samuels, *Mycotaxon* **22**: 18 (1985).

Setiform conidiophores acute and tapered at the apex which is sterile or occasionally fertile, unbranched, verruculose, 180 – 300 um high, 7.5 – 10 um wide at the base, up to 13-septate. *Fertile region* situated either just below the middle of the main axis or higher, occasionally terminal, comprising an irregularly branched, hyaline conidiogenous apparatus. *Conidiogenous cells* ampulliform to lageniform. *Conidia* aseptate, cylindrical, 8 – 12 um long, 1.5 um wide.

Specimen examined: On leaf litter of *Buxus sempervirens*, Cobham, Surrey, U.K., 20 Sept. 1987, B.M. Spooner, IMI 319658.

Chaetopsina fulva is known to have a widespread distribution occurring in both tropical, subtropical and temperate regions including Italy, Ivory Coast, Kenya, Madhaya Pradesh (India), Brazil, New York (USA), Ontario (Canada), Hawaii, Queensland (Australia), Sabah and Peninsular Malaysia (Malaysia). The fungus has been isolated from a wide range of plant species (leaf litter of *Agathis dammara*, *Eucalyptus saligna*, *Laurus nobilis*, *Ocotea usambarensis*, *Podocarpus elatus*, *Shorea maxwelliana*, on needles of *Pinus* sp., on branches of *Araucaria angustifolia*, on stem of *Ziziphus jujuba*, isolated from *Cedrus deodara*) and from soil. The present collection constitutes the first record of this species from the British Isles.

Kirk & Sutton (1987) presented a re-assessment of the genus *Chaetopsina* and, following the results published by Samuels (1985), circumscribed it to include only those taxa where the teleomorph was found in *Nectria* (Fr.) Fr. and which were moniliaceous in character. They specifically excluded species which were dematiaceous and introduced the generic name *Kionochaeta* to accommodate these taxa, speculating that the teleomorph may be eventually found in the Trichosphaeriaceae.

Rambelli (1987), however, preferred to maintain what is undoubtedly a polyphyletic genus and thus an artificial assemblage of species which are obviously not closely related, presumably disposing of those species described by Samuels in genera other than *Chaetopsina*. In contrast, Iturriaga & Korf (1990), in a monograph of the genus *Strossmayeria* (Leotiales; Leotiaceae) and its anamorph *Pseudospiropes*, remark that the '... [anamorph] generic name should surely be held for those species which produce a *Strossmayeria* teleomorph' and that '*Pseudospiropes* needs redefinition to exclude species which do not produce this teleomorph.' The present author would prefer to follow the latter philosophy and reaffirms his original decision regarding the circumscription of *Chaetopsina*.

GYROTHRIX VERTICICLADA (Goidàn.) S. Hughes & Piroz., *N.Z. Jl Bot.* **9**: 42 (1971).
Peglionia verticiclada Goidàn., *Malpighia* **34**: 7 (1935).

Colonies scattered, up to 1 mm or more wide, velvety, black when sterile, with a white base when sporulating prufusely. *Setae* erect, straight, smooth, main stipe 3–5-septate, 50–80 um high, 7–9 um wide near the swollen base, tapering to 6.5–7.5 um wide at the apex; here twice closely dichotomously divided, the four branches up to 7-septate, tapering, up to 100 um long, 5–6.5 um wide at the base, 1.5 um wide at the tip. *Conidiogenous cells* ampulliform to somewhat pyriform, hyaline to subhyaline, 6.5–8 um high, 2.5–3 um wide at the base, c. 1.5 um wide at the apex. *Conidia* falcate, non-septate, hyaline, 14–17 um long, (1–) 1.5 um wide.

Specimen examined: On leaf litter of *Laurus nobilis* Leamington, Hampshire, U.K., 30 March 1991, P.M. Kirk 2290, IMI 348848.

Hughes & Pirozynski (1971) redescribed this distinctive species from material on leaf litter of *Knightia excelsa* collected in New Zealand. It was originally described from Italy on leaves of *Laurus nobilis* and *Prunus laurocerasus* (Goidànich, 1935) and is also known from Australia (on *Araucaria*, *Callistemon*, *Eucalyptus* and *Podocarpus*), India (on *Cinnamomum*, *Jacaranda*, *Mahonia*, *Neolitsea*, *Podocarpus*, *Rhododendron*, *Rhopala*), Kenya (on *Eucalyptus*, *Podocarpus*) and the Canary Islands (on *Laurus azorica*). The present collection constitutes the first record of this species from the British Isles. A second record of this distinct fungus, on leaf litter of *Quercus ilex* (Westonbirt Arboretum, Gloucestershire, U.K.), is also known (J.A. Cooper, pers. comm.)

Previous records of the occurrence of species of *Gyrothrix* and the closely related *Circinotrichum* in the British Isles have been presented elsewhere (Kirk, 1981, 1983). Coincident with the collection of the species described above, and an update on the data presented earlier, additional collections of *Gyrothrix verticillata* Piroz. on *Fagus sylvatica* leaf litter (Castle Ashby, Northamptoshire, 29 June 1991, leg. J.A. Cooper, IMI 348852) and *Daphne laureola* leaf litter (Michleham Downs, Surrey, 6 August 1991, leg. A. Henrici) can be reported.

The author thanks Drs B.M. Spooner and J.A. Cooper for sending him some of the collections cited above, and Dr. A.J. Kuthubutheen for the pre-submission review of the manuscript.

REFERENCES

Goidànich, G. (1935). Un nuovo genere di Demiaziacee Amerospore. *Malpighia* **34**: 5-9.

Hughes, S.J. (1958). Revisiones hyphomycetum aliquot cum appendice de nominibus rejiciendis. *Canadian Journal of Botany* **36**: 727-836.

Hughes, S.J. & Pirozynski, K.A. (1971). New Zealand Fungi 15. *Beltraniella*, *Circinotrichum*, and *Gyrothrix* (Syn. *Peglionia*). *New Zealand Journal of Botany* **9**: 39-45.

Iturriaga, T. & Korf, R.P. (1990). A monograph of the discomycete genus *Strossmayeria* (Leotiaceae), with comments on its anamorph, *Pseudospiropes* (Dematiaceae). *Mycotaxon* **37**: 383-454.

Kirk, P.M. (1981). New or interesting microfungi. III. A preliminary account of microfungi colonizing *Laurus nobilis* leaf litter. *Transactions of the British Mycological Society* **77**(3): 457-473.

Kirk, P.M. (1983). New or interesting microfungi. X. Hyphomycetes on *Laurus nobilis* leaf litter. *Mycotaxon* **18**(2): 259-298.

Kirk, P.M. & Sutton, B.C. (1986). A re-assessment of the anamorph genus *Chaetopsina* (Hyphomycetes). *Transactions of the British Mycological Society* **85** (4): 709-717.

Morgan, A.P. (1895). New North American Fungi. *Journal of the Cincinnati Society of Natural History* **18**: 36-45.

Mercado Sierra, A. & Castañeda Ruiz, R.F. (1987). Nuevos o raros hifomicetes de Cuba. I. Especies de *Cacumisporium*, *Guedea*, *Rhinocladium* y *Veronaea*. *Acta Botanica Cubana* No. **50**: 1-7.

Rambelli, A. (1987). A bibliographic reassesement of the genus *Chaetopsina*. *Micologia italiana* **16**(1): 7-13.

Samuels, G.J. (1985). Four new species of *Nectria* and their *Chaetopsina* anamorphs. *Mycotaxon* **22**: 13-32.

Sutton, B.C. (1973). Hyphomycetes from Manitoba and Saskatchewan, Canada. *Mycological Papers* **132**: 1-143.

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A SERIES OF XEROPHILIC *CHRYSOSPORIUM* SPECIES

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SUMMARY

Xerophilic *Chrysosporium* species related to *C. farinicola* were often isolated from uneaten provisions (pollen-and-nectar mixture) of mason bees (*Osmia* spp.). The fungi have an optimal growth rate on media which are 2 to 3 molar in regard to glucose, exhibit some growth up to 3.6 molar glucose, and initiate a new increased growth rate when the glucose crystallizes out from these supersaturated media. Seven of these species and three varieties are described and separated into a *Farinicola* series of *Chrysosporium* species.

INTRODUCTION

During the years of work with isolation and identification of *Ascosphaera* species it was found that these fungi grew better on media with a higher carbohydrate content than normally used in fungal media. It led, however, to the occurrence of different xerophilic fungi, too (Skou, 1986, 1988), including some species of *Chrysosporium* Corda which apparently are closely related to but different from pollen mould, *C. farinicola* (Burnside) Skou. Their early mycelial growth looks much like that of *Ascosphaera* but they soon produce huge amounts of conidia on the millimeter high, decumbent mycelium, whereas the *Ascosphaera* species produce and ripen their black ascomata more slowly in a somewhat cottony mycelium. The *Chrysosporium* species were isolated from nesting cells with dead larvae of mason bees (*Osmia* spp.), and not least from provisions which were left uneaten in the nest cells (Skou, 1986). *Bettsia*-like ascomata were observed in these lumps of pollen-and-nectar mixture, but a connection between these teleomorphs and any of the isolated *Chrysosporium* anamorphs could not be established (Skou, 1990).

The identification of a number of these *Chrysosporium* species are described below.

MATERIALS AND METHODS

The examined material comprised samples of nest cells with lumps of uneaten provision (Fig. 3a) and dead larvae of different species of mason bees (*Osmia* spp.); these were received from Dr Sv. Nørgaard Holm who had either collected the *Osmia* species in Denmark or received samples from Spain and Sweden for his experiments with pollination. Further, the author has collected some samples in Japan in 1985 (Skou, 1988).

Glucose–rich media were used in order to facilitate isolation and purification of the *Ascosphaera* species, and in this context xerophilic *Chrysosporium* species appeared simultaneously in 51 cases of which 24 isolates were kept for closer examination and comparison with *C. farinicola*.

The growth was studied on the following media:

CzDx: Czapek–Dox Agar (Oxoid).
MYA: 16 g malt extract (Difco), 5 g yeast extract (Difco), and 20 g agar to 1000 ml water.
MGYA: MYA + different concentrations of glucose from one to 3.6 molar which is 20–71.5% as $C_6H_{12}O_6$, H_2O.
MYAS: MYA + different NaCl concentrations from 0.125 to 3.0 molar (7.3–175.5 g per litre).
SDA–20: Modified Sabourauds Dextrose Agar with 20% (1 molar) glucose, 10 g mycological peptone (Oxoid), 5 g yeast extract, and 20 g agar to 1000 ml water.

The glucose was added to the autoclaved media under vigorous stirring and simultaneous heating over a Bunsen burner in order to minimize the risk of browning. Bacterial growth was inhibited by adding aureomycin.

Petri dishes with concentrated media were sealed with tape after inoculation.

Pieces of sheep wool were degreased with diethyl ether, rinsed with absolute ethanol and sterile water. They were then placed on MGYA–30 medium in order to verify keratinolytic activity of the fungi (van Oorschot, 1980). Pieces of cellophane (4×4 cm) were immersed in 70% ethanol, rinsed with sterile water and placed on MGYA–30 medium in order to werify the eventual degradation of cellophane and examine the morphology and formation of conidia on the air mycelium (Carmichael, 1956). Under these conditions, however, neither keratin nor cellophane were affected by any of the *Chrysosporium* species examined.

Growth in the agar was studied *in situ* with a Zeiss Axiovert 35M microscope equipped with Differential–Interference–Contrast (Nomarski) illumination technique which was also applied for examining the fungi on slides in Shear's mounting fluid (Punithalingam, 1971) without addition of stains. Conidial size was based on 200 measurements each, less others were mentioned, and all were made with a Zeiss screw micrometer.

GROWTH AND CONIDIOGENESIS

The terminology of Cole & Samson (1979) and van Oorschot (1980) is used for the conidiogenesis in the species of *Chrysosporium* presented here.

The mycelia grow in, as well as upon, the agar from the points of inoculation and form flat spreading colonies with ramose margins or more or less dome–shaped colonies with entire margins depending on species and media. The decumbent air mycelium grows 1–2 mm high on most media but in some species it becomes more upright and cottony and 4–5 mm high on the very concentrated media. Further, the mycelium of the latter group of species are somewhat velvety on SDA–20.

The single–celled conidia are thallic and produced on unspecialized hyphae, both in the agar and on the air mycelium; however, the hyphae may branch off and produce conidia in bunches like grapes. All the conidia are thick–walled when ripe, and are produced in the following three ways:

1. **Terminal holothallic conidia** on hyphal apices and short lateral branches along the hyphae. They vary considerably in size and shape within each species from globose over subglobose, obovate, and pyriform to clavate. Further, the proportion of globose to more or less pyriform conidia differs from one species to the other (Figs 1 and 2). The secession of conidia is rhexolytic leaving a broad basal scar (van Oorschot, 1980; *i.e.* analogous to the term "on a broad base" commonly used in the taxonomy of yeast, Kreger–van Rij, 1984) with pieces of the outer cell wall or wall–layer of the adjacent hyphal cell attached. The broadness of the scar is determined by the hyphal diameter.

2. **Sessile lateral holothallic conidia** produced on cell sides along the hyphae. They are generally globose, subglobose or ovate, and the basal scar may be as large as the diameter of the conidium. Such conidia may now and then be larger transversally than longitudinally, but this may be observed only when the attached hyphal pieces are visible.

3. **Intercalary, thallic–arthric, conidia.** In the simplest form, they are truncate thick–walled more or less articulating pre–existing (holoarthric) hyphal cells without a significant increase in the hyphal diameter. They occur in chains but may also be single. In other cases – as it is most pronounced in *C. farinicola* – the hyphae become thicker and divide into short, even isodiametric, conidia, for which reason they occur in determinate chains. Such conidia may break open when mounted on slides and release a rounded still thick–walled conidium ("chlamydospore") (Fig. 3b), indicating that the intercalary conidia may have more cell walls. Conidia of this type may be single (enteroarthric) with a more or less conical shape or a one–sided swelling. The intercalary conidia in the agar may be more rounded to globose structures. In some obviously species–dependent cases, a considerable number of conidia grow into comparatively very large cells with several walls or wall–layers.

It is common to give only the average and extremes of the conidial size in taxonomical context. This is, however, sparse and not very useful information in cases where the variations in shape, length and width of the conidia are large and where the

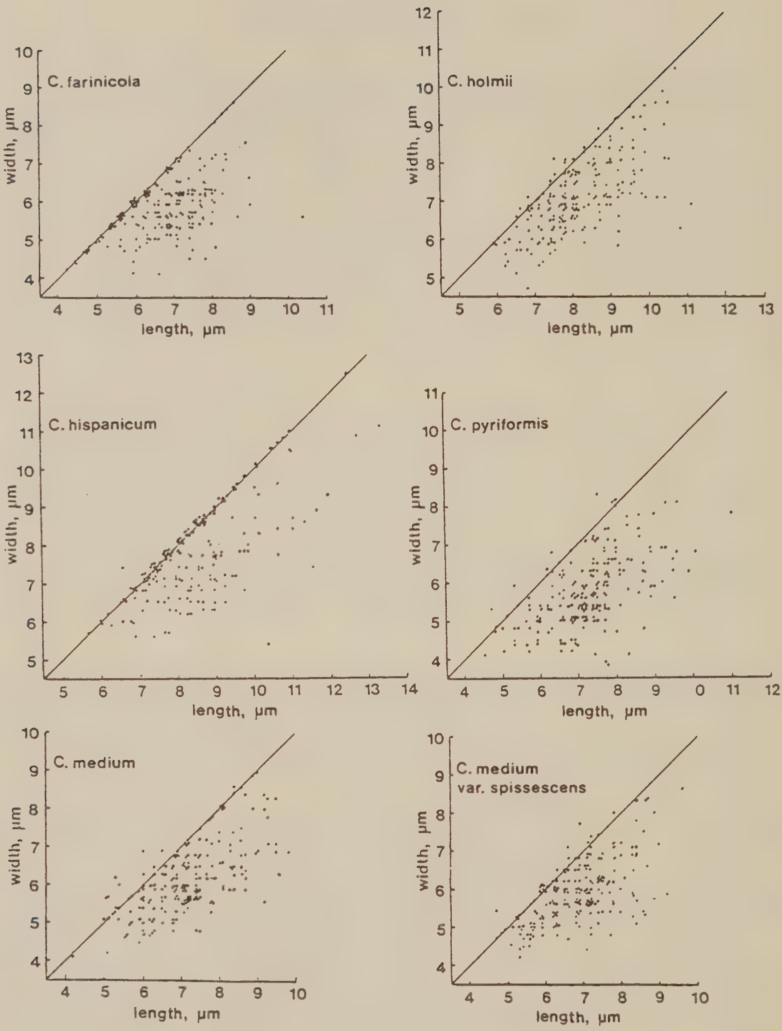


Figure 1. Distribution in size and shape of conidia of different *Chrysosporium* species. The conidia are globose to subglobose along the bisectrix and increasingly pyriform to clavate with increasing distance from the bisectrix.

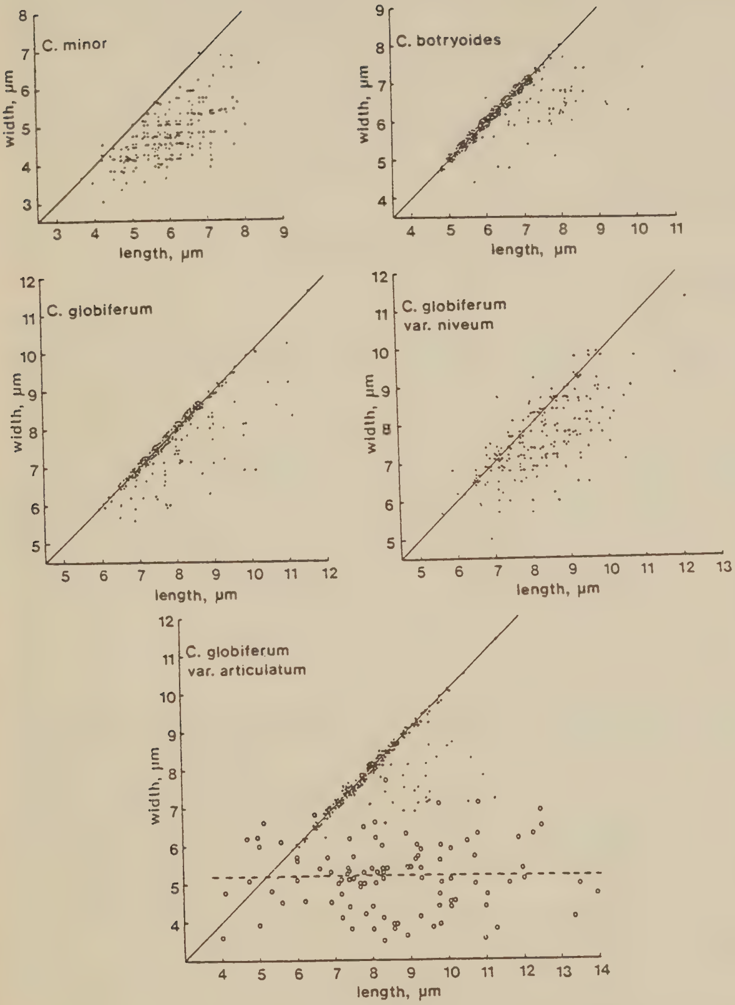


Figure 2. Distribution in size and shape of conidia of different *Chrysosporium* species, cf. figure 1. o = articulate, free truncate, thallic–arthric conidia with the same average diameter as that of the hyphae in *C. globiferum* var. *articulatum.*

proportion of different shapes is of importance for identification as in the present cases under study. The differences in size and shapes of the conidia within and between the species are therefore visualized in systems of coordinates with the bisectrix drawn (Figs 1 and 2). Conidia above the bisectrix are larger in width than in length, globose to subglobose along it, and they vary from obovate to pyriform or clavate below. The amount of globose conidia is given for each species, and, as differences in lengths and widths less than ten per cent cannot be recognized, all such conidia are regarded as globose to subglobose.

SERIES AND SPECIES

Series *Farinicola* Skou *ser. nov.*

The species described below are so closely related to *C. farinicola* and different from other *Chrysosporium* species, that it has been proposed that they be placed in a separate series of the genus *Chrysosporium*.

Descriptio: *Farinicola series nova. In morphologiam Chrysosporium farinicola* (Burnside) Skou *fundata. Mycelium densum, humile et decumbens vel prominulo, plus minusve intramatricacibus. Coloniis planis vel rugosis vel sulcatis tholiformis. Colores aversi et reversi ex specie et substratis pendentes. Conidiae unicellulares cum parietum crassis, holothallis terminalibus vel sessilis lateralibus, globosae ad subglobosae et plus minusve pyriformibus. Proportio conidiorum globosarum ad subglobosa specie pendens et ratione longitudinis pro latitudine conidiis pyriformibus 1.20 ad 1.30. Conidiae intercalares, thallis-arthricibus, truncatis plerumque est.*

Status anamorphis in neotypo Bettsia alvei (Betts) Skou (CBS 688.71) *typus est.*

Description: The series is based on the morphology of *C. farinicola*. Mycelium dense, low, decumbent or slightly raised and more or less intramatrical in the agar. Colonies flat, rugose or dome-shaped and furrowed. Colour of avers and revers dependent on species and media. Conidia single-celled, holothallic, terminal or sessile on hyphal sides, globose to subglobose and more or less pyriform, further intercalary truncate conidia may be more or less dominating. The proportion of globose to subglobose conidia species-dependent, and length-to-width ratio of pyriform conidia is 1.20 to 1.30.

The type is the anamorph state of the neotype of *Bettsia alvei* (Betts) Skou CBS 688.71 (Skou, 1972).

1. *Chrysosporium farinicola* (Burnside) Skou 1975

Basionym: *Ovularia farinicola* Burnside 1928.
Synonym: *C. fastidium* Pitt 1966 (van Oorschot, 1980).
Teleomorph: *Bettsia alvei* (Betts) Skou 1972.
Basionym: *Pericystis alvei* Betts 1912.

As this species is described in detail by Burnside (1928), Skou (1975), and van Oorschot (1980), only characters of importance in its comparison with the new species described below will be presented here.

C. farinicola has 41.5% globose to subglobose conidia of 4.2 – 5.9 – 8.6 µm and 58.5% more or less pyriform conidia of 4.1×5.0 – 5.7×7.2 – 7.5×10.4 µm with a length–to–width ratio of 1.26 (Figs 1 and 4d). It is a comparatively small–spored species within the series. The truncate, thallic–arthric conidia dominate in cultures of this fungus (Fig. 3c) in the agar as well as on the air mycelium up to about 2 molar and none at 3 molar glucose. The truncate conidia alternate with rounded to globose conidia in the agar. The conidia occur on lateral branches along the hyphae but with a minor tendency to branch off and produce conidia in bunches on the air mycelium as well as in agar apart from the growth on the very concentrated media.

C. farinicola grows neither on CzDx nor on MYA but it does grow excellently on the latter medium with 20–60% glucose added (*i.e.* 1–3 molar based on $C_6H_{12}O_6$, H_2O) with an optimum of about 50–60% glucose. The growth rate increasingly reduces at higher concentrations, but a new profused growth initiates as the glucose crystallizes out from these supersaturated media on standing, and the hyphae may be observed growing between the crystals. Growth is almost as excellent on SDA–20. Colonies on these media are dense, flat spreading, 1–2 mm high with lobate to ramose margins and no surface structures. The averse is snow–white and the reverse faint yellowish to pale apricot on MGYA and pale orange on SDA–20 with age. Growth on NaCl–media is comparatively restricted. A very slow, faint growth appears on MYA with 7.3 g NaCl (0.125 molar) per litre, and the growth is about optimum in 58.5 g (1 molar) NaCl per litre. No growth occurs on 2 molar NaCl.

2. *Chrysosporium holmii* Skou *sp. nov.*

Etymology: The Latin epithet '*holmii*', genitive of Holm, is given in honour of Dr Sv. Nørgaard Holm, who inspired the work with *Ascosphaera* and allied species during his comprehensive investigations of solitary bees as pollinators of cultivated plants.

Descriptio: *Chrysosporium holmii species nova. Hyphae 2.1 – 4.4 – 8.6 µm crassae, album, decumbens; coloniis densis et humiliter cum margine ramoso; reversus dilute armeniacus in 30% glucosum agaro et aurantiacus cum superficibus rugosis in 20% glucosum agaro Sabouraudii. Conidiae unicellulares, holothallis, terminalibus vel sessilis lateralibus cum pariete crasso, globosa ad plus minusve pyriformis. Pars globosa ad subglobosam 39 pro 100, 5.9 – 7.8 – 10.5 µm magna. Pars plus minusve pyriformis 61 pro 100, 4.7×6.8 – 6.8×8.3 –11.3×12.8 µm magna et ratione longitudinis pro latitudine 1.22. Conidiae truncatis intercalares, thallis–arthricibus, praesentibus.*

Habitat in cibaria in nidis Osmiae rufis L.

Holotypus anno 1984 in nido Osmiae rufis L. *in Glostrup, Dania lectus per auctorem cultus, vivis prolibus in vivario Neerlandico Baarnensi sub numeris CBS 487.91 traditis et mycelio sporifero sicco typifico in Museo et Herbario Botanico Hauniensi (C) deposito.*

Description: Hyphae 2.1 – 4.4 – 8.6 µm in diam., decumbent in 1–2 mm high dense, white colonies with ramose margins and on SDA–20 with a wrinkled surface. The reverse is pale apricot–coloured in MGYA–30 and orange in SDA–20. Conidia single–celled, holothallic, terminal on hyphal apices and short lateral branches or sessile on the hyphal sides, thick–walled, varying in shape from globose to more or less pyriform, and occurring in the agar as well as on the air mycelium. The globose to subglobose part of the conidia constitute 39% and is 5.6 – 7.8 – 10.5 µm, whereas 61% is more or less pyriform, 4.7×6.8 – 6.8×8.3 – 11.3×12.8 µm with a length–to–width ratio of 1.22 (Figs 1, 3d, and 4e). Intercalary truncate, thallic–arthric, conidia occur but never in pronounced amounts, and they are not observed in the agar where huge quantities of globose conidia are produced apart from growth on the most concentrated media.

Habitat in provisions in nest cells of *Osmia rufa* L.

Holotype in nest cells of *Osmia rufa* L. collected in the garden of Dr Sv. Nørgaard Holm at Glostrup, Denmark. Culture No. 1150 deposited at CBS, Baarn, The Netherlands, with accession No. CBS 487.91. A dried culture of No. 1150 is chosen as holotype and deposited in the Botanical Museum and Herbarium, Copenhagen, Denmark (C).

The material examined consists of the above–mentioned collection.

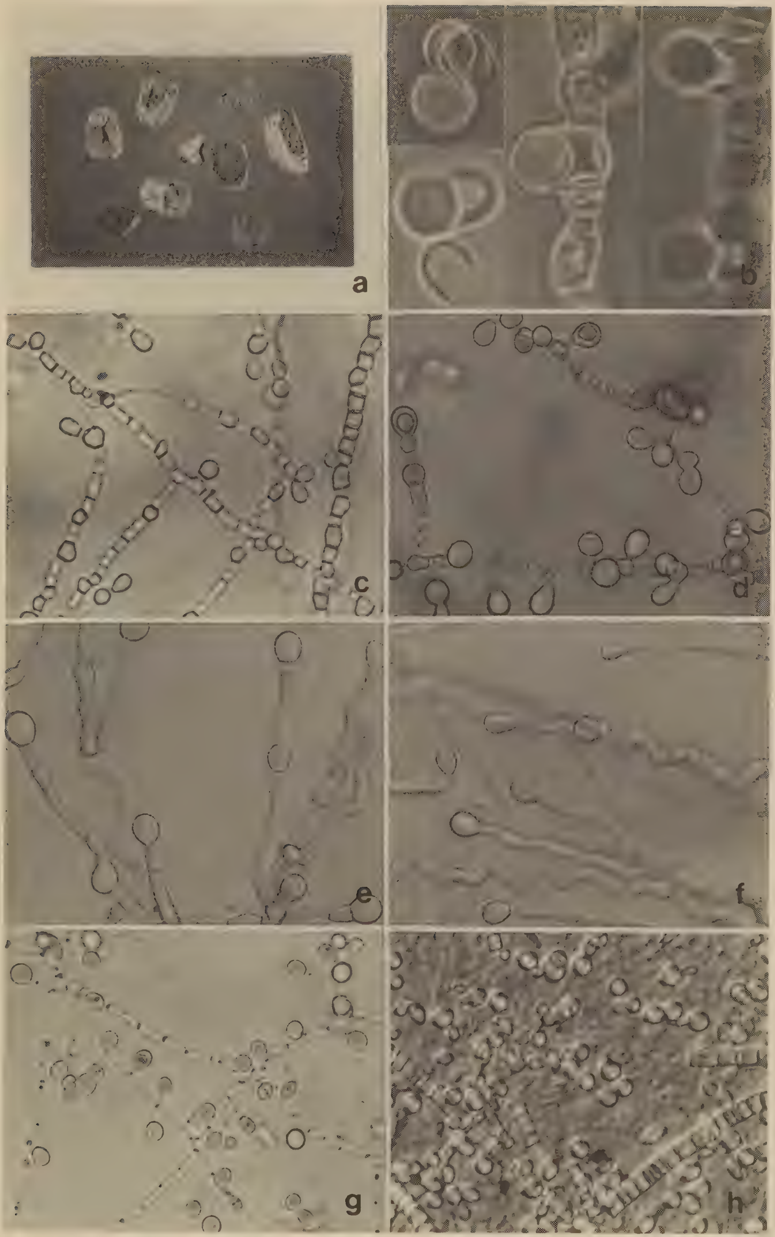
Growth conditions: No growth on CzDx and only traces on MYA. Excellent growth on 1–3 molar MGYA, though with a lower optimum than *C. farinicola*, but like this species, *C. holmii* grows profusely when glucose crystallizes out from the supersaturated media on standing. *C. holmii* has also a lower growth rate on SDA–20 than *C. farinicola*, and though the colonies are flat–spreading, their surfaces are wrinkled and radially furrowed; further, the orange revers turn light brownish with age. *C. holmii* grows on MYAS from 0.125 to 2 molar NaCl with an optimum of about 1 molar, though at a much lower growth rate than on the glucose media.

3. *Chrysosporium hispanicum* Skou *sp. nov.*

Etymology: The Latin epithet '*hispanicum*' = from Spain is given because the fungus was found in a collection of nest cells of *Osmia cornuta* L. received from Spain by Dr Sv. Nørgaard Holm, and it has since then been cultured under that name (Skou, 1986).

Descriptio: *Chrysosporium hispanicum species nova. Hyphae 3.3 – 5.7 – 9.6 µm crassae, album, decumbens; coloniis densis, humilibus et planis vel rugosis cum mar–*

Figure 3a–h. a: Pollen–and–nectar lumps (provision) from the Swedish collection from which *C. pyriformis* was isolated, natural size, **b:** Release of thick–walled rounded conidia from the intercalary conidia of *C. farinicola*, × 1000, **c:** *C. farinicola in situ* in agar with different types of holothallic and thallic–arthric conidia as described, **d:** *C. holmii in situ* in agar with sessile conidia and conidia on lateral branches, **e:** *C. hispanicum*, and **f:** *C. pyriformis in situ* in 3 molar glucose agar with terminal conidia, **g:** *C. medium* var. *spissescens in situ* in agar with sessile conidia and conidia on lateral branches, **h:** *C. globiferum* from air mycelium on 3 molar glucose agar. Note the conspicuous globose conidia and the hyphal pieces with intercalary conidia; c–h × 320.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gine ramoso, reversus dilute aurantiacus in 30% glucosum agaro et 20% glucosum agaro Sabouraudii. Conidiae holothallis, terminalibus vel sessile lateralibus cum pariete crasso, globosa ad plus minusve pyriformis. Pars globosa ad subglobosam 55.5 pro 100, 5.7 – 8.1 – 12.5 µm magna. Pars plus minusve pyriformis 44.5 pro 100, 5.4×6.3 – 7.2×8.8 – 11.1×13.4 µm magna et ratione longitudinis pro latitudine 1.23. Conidiae truncatis intercalares, thallis–arthricibus, non observatus vel sparsis praesentibus in culturis veteribus.

Habitat in cibaria in nidis Osmiae cornutae Latr.

Holotypus anno 1983 in nido Osmiae cornutae Latr. *in Vallisoletum, Hispania lectus per auctorem cultus, vivis prolibus in vivario Neerlandico Baarnensi sub numeris CBS 486.91 traditis et mycelio sporifero sicco typifico in Museo et Herbario Botanico Hauniensi (C) deposito.*

Description: Hyphae 3.3 – 5.7 – 9.6 µm in diam., decumbent in 1–2 mm high, white, dense colonies that are flat on MGYAs and with wrinkled surfaces on SDA–20 and ramose margins. The reverse is faint orange both in MGYA–30 and SDA–20. The conidia are single–celled, holothallic, terminal on hyphal apices and short lateral branches or sessile on the hyphal sides, thick–walled and varying in shape from globose to more or less pyriform on the air mycelium, and in the agar occurs almost exclusively conidia with the latter shape (Figs 3e and 4g). The globose to subglobose part of the conidia constitute 55.5% and is 5.7 – 8.1 – 12.5 µm, whereas 44.5% is more or less pyriform and 5.4×6.3 – 7.2×8.8 – 11.1×13.4 µm with a length–to–width ratio of 1.23 (Figs 1 and 4b). In the agar on the most concentrated media, only terminal conidia are present (Fig. 3e). Intercalary, thallic–arthric, conidia not observed or very sparsely present in aged cultures.

Habitat in provisions in nest cells of *Osmia cornuta* Latr.

Holotype in nest cells of *Osmia cornuta* Latr. received from Valladolid in Spain 1983. Culture No. 1101 deposited at CBS, Baarn, The Netherlands with accession No. CBS 486.91. A culture of No. 1101 is chosen as holotype and deposited in the Botanical Museum and Herbarium, Copenhagen, Denmark (C).

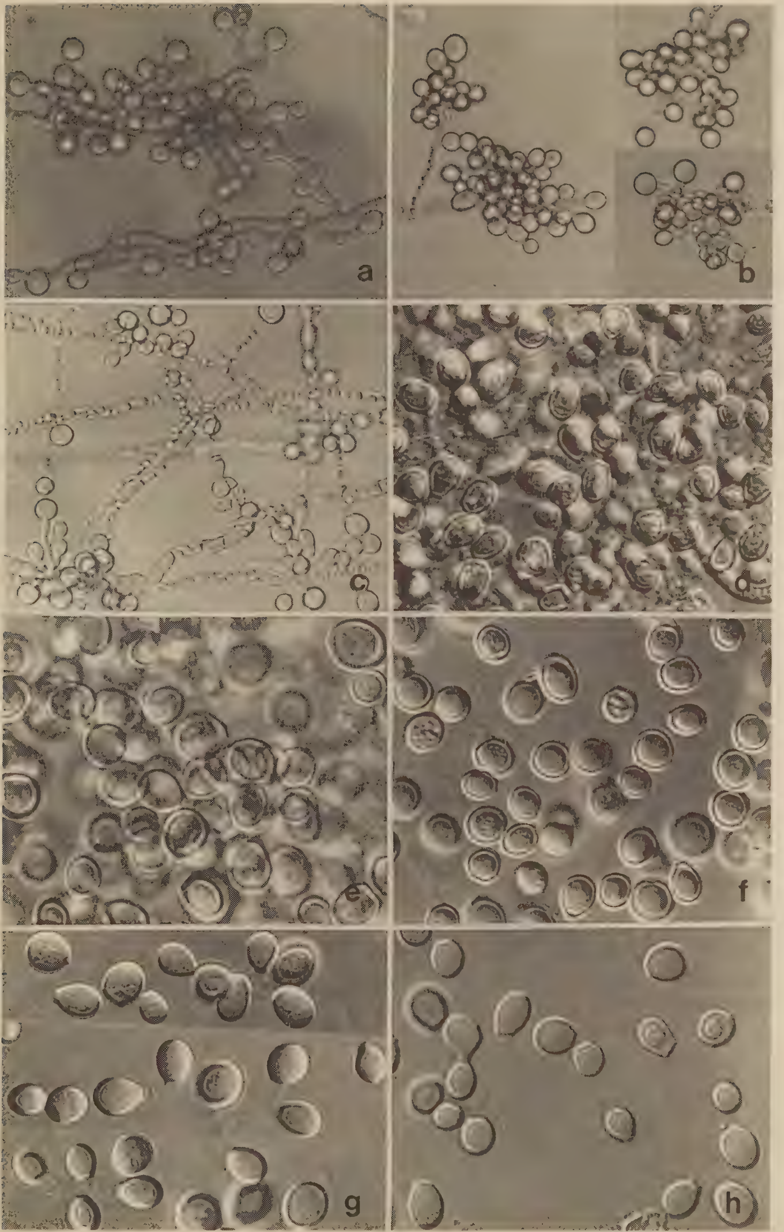
The material examined consists of the above–mentioned collection.

Growth conditions not significantly different from those of *C. holmii* apart from the fact that there was no growth at all on MYA.

4. *Chrysosporium pyriformis* Skou *sp. nov.*

Etymology: '*pyriformis*' from '*pyrus*' = pear and '*formis*' from '*forma*' = form, shape, indicating that the main part of the conidia is more or less pear shaped.

Figure 4a–h. a: *C. globiferum* and **c:** *C. globiferum* var. *niveum in situ* in agar with and without a tendency to form bunches of conidia on short lateral hyphae and with rounded intercalary structures, **b:** *C. botryoides in situ* in agar with bunches of conidia on short lateral hyphae, **d:** *C. farinicola* conidia, **e:** *C. holmii* conidia, **f:** *C. hispanicum* conidia, **g:** *C. pyriformis* conidia, and **h:** *C. medium* conidia; a–c × 320, d–h × 750.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Descriptio: Chrysosporium pyriformis species nova. Hyphae 3.0 – 5.0 – 8.4 μm crassae, album et decumbens; coloniis densis et humilibus, planis vel plicatis cum margine ramoso; reversus incolores ad dilute aurantiascens postea in 20% glucosum agaro Sabouraudii. Conidiae unicellulares, holothallis, terminalibus vel sessilis lateralibus cum pariete crasso, globosus paucis et plus minusve pyriformis dominatibus. Pars globosa ad subglobosam 18 pro 100, 4.3 – 6.6 – 8.0 μm magna. Pars plus minusve pyriformis 82 pro 100, 4.2×5.0 – 5.6×7.4 – 7.8×11.0 μm magna et ratione longitudinis pro latitudine 1.31. Conidiae truncatis intercalares, thallis–arthricibus, sparsis praesentibus.

Habitat in cibaria in nidis Osmiae rufis L.

Holotypus anno 1984 in nido Osmiae rufis L. *in Suecia lectus per auctorem cultus, vivis prolibus in vivario Neerlandico Baarnensi sub numeris CBS 491.91 traditis et mycelio sporifero sicco typifico in Museo et Herbario Hauniensi (C) deposito.*

Description: Hyphae 3.0 – 5.0 – 8.4 μm in diam., decumbent in 1–2 mm high, white, dense colonies that are flat on the MGYA, folded on SDA–20, and with ramose margins and colourless reverses that may turn pale orange on SDA–20 with age. The conidia are single–celled, holothallic, terminal on hyphal apices and short lateral branches or sessile on the hyphal sides, thick–walled and varying in shape from 18% globose to 82% that are more or less pyriform and occurring in the agar as well as on the air mycelium. The globose to subglobose part of the conidia is 4.3 – 6.6 – 8.0 μm, and the pyriform part is 4.2×5.0 – 5.6×7.4 – 7.8×11.0 μm with a length–to–width ratio of 1.31 (Figs 1 and 4g). In the agar on the most concentrated media, only terminal conidia are present (Fig. 3f). Intercalary, thallic–arthric, conidia present, on the air mycelium truncate, in the agar more or less rounded.

Habitat in provisions in nest cells of *Osmia rufa* L.

Holotype in nest cells of *Osmia rufa* L. collected in Sweden (exact place unknown). Culture No. 1189 deposited at CBS, Baarn, The Netherlands, with accession No. CBS 491.91. A dried culture of No. 1189 is chosen as holotype and deposited in the Botanical Museum and Herbarium, Copenhagen, Denmark (C).

The material examined consists of the above mentioned collection.

Growth conditions not significantly different from those of *C. holmii* apart from the fact that no growth at all occurs on MYA.

5. *Chrysosporium medium* Skou *sp. nov.*

Etymology: 'medium' = in the middle. The epithet indicate that the average conidial size and the amount of globose conidia lay in between those of *C. hispanicum* and *C. minor* (see below).

Descriptio: Chrysosporium medium species nova. Hyphae 2.4 – 4.7 – 9.5 μm crassae, album, decumbens; coloniis densis et humilibus, planis vel rugosis cum margine ramoso; reversus incolores in extracto maltoso agaro cum glucosum crescens divertibus, dilute armeniascens in 20% glucosum agaro Sabouraudii postea. Conidiae unicellulares, holothallis, terminalibus et sessilis lateralibus cum pariete crasso, globosa ad plus minusve pyriformis. Pars globosa ad subglobosam 35 pro 100, 4.2 – 6.7 – 9.0 *µm magna. Pars plus minusve pyriformis 65 pro 100, 4.2×5.1 – 5.9×7.3 – 6.9×9.8 µm magna et ratione longitudinis pro latitudine 1.23. Conidiae truncatis, thallis–arthricibus, seriatim vel singulatim sparsis praesentibus.*

Habitat in cibaria in nidis Osmiae rufis L.

Holotypus anno 1984 in nido Osmiae rufis L., *at Tåstrup, Dania lectus per auctorem cultus, vivis prolibus in vivario Neerlandico, Baarnensi sub numeris CBS 488.91 traditis et mycelio sporifero sicco typifico in Museo et Herbario Hauniensi (C) deposito.*

Description: Hyphae 2.4 – 4.7 – 9.5 µm in diam., decumbent in 1–2 mm high, dense, white colonies that are flat on MGYA and wrinkled on SDA–20; margins ramose, revers uncoloured to pale apricot on various concentrations of MGYA and SDA–20 on standing, respectively. Conidia single–celled, holothallic, terminal on hyphal apices and short lateral branches or sessile on the hyphal sides, thick–walled and varying in shape from globose to more or less pyriform in the agar as well as on the air mycelium. The globose to subglobose part of the conidia constitute 35% and is 4.2 – 6.7 – 9.0 µm, whereas the 65% more or less pyriform conidia is 4.2×5.1 – 5.9×7.3 – 6.9×9.8 µm with a length–to–width ratio of 1.23 (Figs 1 and 4h). Intercalary truncate, thallic–arthric, conidia occurring in chains or singly are sparsely present on the air mycelium. The intercalary conidia in the agar are more abundant and rounded to globose apart from growth on the most concentrated media.

Habitat in provisions in nest cells of *Osmia rufa* L.

Holotype in nest cells of *Osmia rufa* L. collected at Tåstrup, Denmark. Culture No. 1155 deposited at CBS, Baarn, The Netherlands with accession No. CBS 488.91. A dried culture of No. 1155 is chosen as holotype and deposited in the Botanical Museum and Herbarium, Copenhagen, Denmark (C).

The material examined consists of the above–mentioned collection.

Growth conditions are not significantly different from those of *C. holmii* apart from a somewhat weaker growth on MYAS–agars.

6. *Chrysosporium medium* var. *spissescens* Skou *var. nov.*

Etymology: '*spissescens*' = becoming thick, thickening. This varietal epithet is given due to production of a considerable number of especially large and thick–walled conidia.

Descriptio ex varietatibus: *Hyphae 2.3 – 4.8 – 11.4 µm crassae. Pars conidiarum globosarum ad subglobosa 37.5 pro 100, 4.2 – 6.3 – 8.7 µm magna et pars plus minusve pyriformis 62.5 pro 100, 4.5×5.1 – 5.7×7.0 – 5.5×9.2 µm magna et ratione longitudinis pro latitudine 1.23. Conidiae singulatim plus grandis cum parietibus spissescentibus in aliquantum praesentibus, 7.8×11.3 – 12.3×13.6 –21.0×21.9 µm magna. Aliis characteribus idem ac Chrysosporium medium.*

Habitat in cibaria in nidis Osmiae rufis L.

Holotypus anno 1984 in nido Osmiae rufis L. *at Tåstrup, Dania per auctorem cultus, vivis prolibus in vivario Neerlandico, Baarnensi sub numeris CBS 489.91* *traditis et mycelio sporifero sicco typifico in Museo et Herbario Hauniensi (C) deposito.*

Description: Hyphae 2.3 – 4.8 – 11.4 µm in diam. The globose to subglobose part of the conidia constitute 37.5% and is 4.2 – 6.3 – 8.7 µm, whereas the 62.5% more or less pyriform conidia is 4.5×5.1 – 5.7×7.0 – 5.5×9.2 µm with a length–to–width ratio of 1.23 (Figs 1 and 5a). A considerable number of very large conidia occur, 7.8×11.3 – 12.3×13.6 – 21.0×21.9 µm, based on 100 measurements (Fig. 5b). Their cell–walls are thickening because of the formation of either new wall layers or walls, one upon the other. Primordia of ascomata were observed (Fig. 5c). Intercalary conidia in the agar are clearly less pronounced than in *C. medium*. Other characters and growth conditions as for *C. medium*.

Habitat in provisions in nest cells of *Osmia rufa* L.

Holotype in nest cells of *Osmia rufa* L. of the same collection as that with *C. medium*. Culture No. 1158 deposited at CBS, Baarn, The Netherlands with accession No. CBS 489.91. A dried culture of No. 1158 is chosen as holotype and deposited in the Botanical Museum and Herbarium, Copenhagen, Denmark (C).

7. *Chrysosporium minor* Skou *sp. nov.*

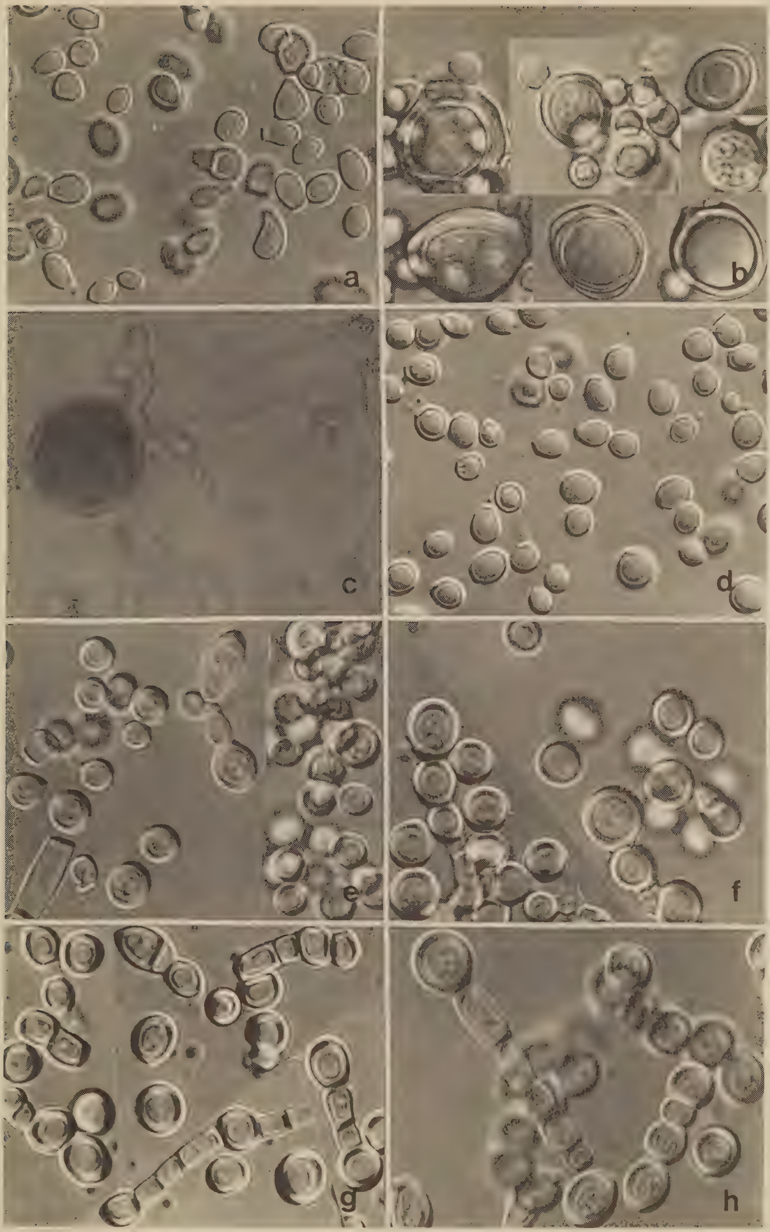
Etymology: '*minor*' = smaller. The epithet is given due to the comparatively smaller conidia than those of the other species of this series of *Chrysosporium* species.

Descriptio: *Chrysosporium minor species nova. Hyphae 2.3 – 4.9 – 9.8 µm crassae, album et decumbens; coloniis densis et humilibus, planis vel rugosis cum margine leniter ramosus; reversus incolores in extracto maltosum agaro cum glucosum crescens divertibus, margine integris et reversus dilute armeniascens in 20% glucosum agaro Sabouraudii postea. Conidiae unicellulares, holothallis, terminalibus vel sessilis lateralibus cum pariete crasso, globosa ad subglobosam aliquot 15 pro 100, 4.4 – 5.0 – 5.6 µm magna ad plus minusve pyriformis 85 pro 100, 3.0×4.2 – 4.7×6.1 – 6.6×8.4 µm magna et ratione longitudinis pro latitudine 1.30. Conidiae truncatis intercalares, thallis–arthricibus, sparsis praesentibus.*

Habitat in cibaria in nidis Osmiae rufis L.

Holotypus anno 1984 in nido Osmiae rufis L. *in Karlslunde, Dania lectus per auctorem cultus, vivis prolibus in vivario Neerlandico Baarnensi sub numeris CBS 490.91 traditis et mycelio sporifero sicco typifico in Museo et Herbario Hauniensi (C) deposito.*

Figure 5a–h. a: *C. medium* var. *spissescens* conidia, **b:** The special large and thick–walled conidia of that variety, **c:** Young ascoma of *C. medium* var. *spissescens* in situ in agar. Note the treminal conidia on apices and short lateral branches, **d:** *C. minor* conidia, **e:** *C. botryoides* conidia – to the right a dense row of conidia on lateral hyphae, **f:** *C. globiferum* conidia, **g:** *C. globiferum* var. *articulatum* conidia with hyphal pieces with intercalary truncate conidia attached, **h:** *C. globiferum* var. *niveum* conidia; a–b and d–h × 750, c × 400.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Description: Hyphae 2.3 – 4.9 – 9.8 µm in diam., decumbent in 1–2 mm high, dense, white colonies that are flat with ramose margins and uncoloured reverses on MGYAs but wrinkled with entire margins and pale apricot reverses on SDA–20 on standing. Conidia single–celled, holothallic, terminal on hyphal apices and short lateral branches or sessile on the hyphal sides, thick–walled, varying in shape from globose to more or less pyriform in the agar as well as on the air mycelium. The globose to subglobose part of the conidia constitute 15% and is 4.4 – 5.0 – 5.6 µm, whereas the 85% more or less pyriform conidia is 3.0×4.2 – 4.7×6.1 – 6.6×8.4 µm with a length–to–width ratio of 1.30 (Figs 2 and 5d). Intercalary truncate, thallic–arthric, conidia on the air mycelium sparsely present. However, they are mostly single and rounded in the agar.

Habitat in provisions in nest cells of *Osmia rufa* L.

Holotype in nest cells of *Osmia rufa* L. collected in a garden at Karlslunde, Denmark. Culture No. 1161 deposited at CBS, Baarn, The Netherlands with accession No. CBS 490.91. A dried culture of No. 1161 is chosen as holotype and deposited in the Botanical Museum and Herbarium, Copenhagen, Denmark (C).

The material examined consists of the above–mentioned collection and the same as that of *C. medium*.

Growth conditions are not significantly different from those of *C. holmii*.

8. ***Chrysosporium botryoides*** **Skou** ***sp. nov.***

Etymology: '*botryoides*' from the Greek '*botrys*' = bunch of grapes, and '*oides*' = like, looking like. The epithet is given because the mycelium has a pronounced tendency to branch off and produce conidia in bunches both in the agar and on the air mycelium.

Descriptio: *Chrysosporium botryoides species nova. Hyphae 3.3 – 5.2 – 7.7 µm crassae, album; coloniis a decumbentibus et humilibus, 1–2 mm altum, in infero contento glucosum agaro cum margine subramosus et reversus lutescens, ad prominulo 4–5 mm altum in summa glucosum agaro cum margine integris et reversus incolores ad cerinescens; in 20% glucosum agaro Sabouraudii intramatricacibus, sulcatis tholiformibus, integris, velutinis cum aversus calcareus et reversus dilute fulvus postea. Conidiae unicellulares, holothallis, terminalibus et sessilis lateralibus cum pariete crasso, globosa ad plus minusve pyriformis. Pars globosa ad subglobosam 78.5 pro 100, 4.7 – 6.1 – 8.0 µm magna. Pars plus minusve pyriformis 21.5 pro 100, 4.4×5.7 – 6.4×7.9 – 8.0×10.2 µm magna et ratione longitudinis pro latitudine 1.23. Conidiae truncatis intercalares, thallis–arthricubus, sparsis praesentibus.*

Habitat in cibaria in nidis Osmiae cornifrontis (Radoszkowski).

Holotypus anno 1985 in cibaria Osmiae cornifrontis (Radoszkowski) *in regione Nagano, Japonia lectus per auctorem cultus, vivis prolibus in vivario Neerlandico Baarnensi sub numeris CBS 492.91 traditis et mycelio sporifero sicco typifico in Museo et Herbario Botanico Hauniensi (C) deposito.*

Description: Hyphae 3.3 – 5.2 – 7.7 µm in diam., decumbent in 1–2 mm high, dense, white weakly ramose colonies at lower concentrations of MGYA where the reverse becomes pale yellowish with age; slightly raised to 4–5 mm on 3 molar MGYA with entire margin and uncoloured reverse which becomes yellow with a hint of reddish–

brown with age. On SDA–20, the colonies are dome–shaped, furrowed, velvety with entire margins and an inward arched pale brownish reverse. Conidia single–celled, thick–walled, holothallic, terminal on hyphal apices and short lateral branches with a pronounced tendency to occur so close together that they look like bunches of grapes both in the agar (Fig. 4b) and on the air mycelium; or they are sessile on hyphal sides, varying in shape from globose to more or less pyriform. The globose to subglobose part of the conidia constitute 78.5% and is 4.7 – 6.1 – 8.0 μm, whereas the 21.5% more or less pyriform conidia measure 4.4×5.7 – 6.4×7.9 – 8.0×10.2 μm with a length–to–width ratio of 1.23 (Figs 2 and 5e). Intercalary, thallic–arthric, conidia sparsely present, truncate on the air mycelium and rounded in the agar, single or a few in chains.

Habitat in provisions in nest cells of *Osmia cornifrons* (Radoszkowski).

Holotype anno 1985 collected in nest cells of *Osmia cornifrons* in bamboo canes in the Nagano region, Japan. Culture No. J 30a deposited at CBS, Baarn, The Netherlands with accession No. CBS 492.91. A dried culture of No J 30a is chosen as holotype and deposited in the Botanical Museum and Herbarium, Copenhagen, Denmark (C).

Material examined: Five different cultures were isolated from the samples of *O. cornifrons* collected in the Nagano region in 1985 (Skou, 1988).

Growth conditions: No growth on CzDx and MYA. The growth rate was generally lower on the MGYAs than that of the above–described species, but still excellent on 1–3 molar in glucose and a strongly decreased growth at higher concentrations until the glucose crystallizes out from the supersaturated media at which a profused growth initiates. Good growth on SDA–20, and slow growth on MYASs with a tendency to optimum at 0.5 molar NaCl and no growth at 2.0 molar NaCl.

9. *Chrysosporium globiferum* Skou *sp. nov.*

Etymology: '*globiferum*' from Latin '*globus*' = ball, globe, and '*fer*' = carrying. The epithet is given due to the relatively very large amount of globose conidia produced.

Descriptio: *Chrysosporium globiferum species nova. Hyphae 3.2 – 4.9 – 7.8 μm crassae, album, aliquot articulatum; coloniis decumbentibus, 1–2 mm altum et margine subramosum ad prominulo in infero contento glucosum agaro cum aversus clare flavovirens et reversus ochraceus postea, 4–5 mm altum in summa glucosum agaro cum aversus candidus et reversus incolores ad armeniascens postea et margine integris; in 20% glucosum agaro Sabouraudii intramatricacibus, sulcatis tholiformis integris, velutinis cum aversus flavovirens ad cineraceus et reversus plus minusve recavis et brunneus postea. Conidiae unicellulares, holothallis, terminalibus et sessilis lateralibus cum pariete crasso, globosa ad plus minusve pyriformis. Pars globosa ad subglobosam 83 pro 100, 5.9 – 7.8 – 11.6 μm magna. Pars plus minusve pyriformis 17 pro 100, 5.7×8.6 – 7.1×8.6 – 8.3×11.1 μm magna et ratione longitudinis pro latitudine 1.20. Conidiae intercalares truncatis, thallis–arthricibus, aliquantum praesentibus.*

Habitat in cibaria in nidis Osmiae cornifrontis (Radoszkowski).

Holotypus anno 1985 in cibaria Osmiae cornifrontis in regione Nagano, Japonia lectus per auctorem cultus, vivis prolibus in vivario Neerlandico Baarnensi sub numeris CBS 454.91 traditis et mycelium sporifero sicco typifico in Museo et Herbario Botanico Hauniensi (C) deposito.

Description: Hyphae 3.2 – 4.9 – 7.8 µm in diam., white, decumbent and with some tendency to fall in pieces or single cells; colonies on one to two molar MGYA 1–2 mm high, dense with slightly ramose margins and bright yellowish–green averse in direct artificial light – less in daylight; mycelium slightly raised and 4–5 mm high and colonies with entire margins on more concentrated MGYA where averses are pure white and reverses initially uncoloured becoming apricot with age; in 20% SDA–20 intramatricular, velvety, furrowed, dome–shaped and may thereby now and then become so recaved that the agar bursts, averse colour varying from yellowish–green to pale ashgeryish and reverse turn deep brown with age. Conidia single–celled, thick–walled, holothallic, terminal on hyphal apices and on short lateral branches or sessile on hyphal sides, globose to more or less pyriform and with some tendency to occur in bunches (Fig. 4a). The globose to subglobose part of the conidia constitute 83% and is 5.9 – 7.8 – 11.6 µm, and the 17% more or less pyriform conidia is 5.7×6.5 – 7.1×8.6 – 8.3×11.1 µm with a length–to–width ratio of 1.20 (Figs 2, 3h, and 5f). Intercalary truncate, thallic–arthric, conidia occur in considerable amounts, truncate on the air mycelium and rounded in the agar.

Habitat in provisions in nest cells of *Osmia cornifrons* (Radoszkowski).

Holotype anno 1985 collected in nests of *Osmia cornifrons* in bamboo canes in the Nagano region, Japan. Culture No. J 23a deposited at CBS, Baarn, The Netherlands with accession No. CBS 454.91. A dried culture of No. J 23a is chosen as holotype and deposited in the Botanical Museum and Herbarium, Copenhagen, Denmark (C).

Material examined: Nine cultures with the mentioned characters were isolated from different parts of the Japanese collections of *O. cornifrons* (Skou, 1988).

Growth conditions as for *C. botryoides* in most respects. Traces of growth on MYA–agar on long standing, and a higher growth rate on MYASs without significant differences between 0.125 and 1.0 molar NaCl, only with a tendency to attain an optimum at 0.5 molar NaCl.

10. *Chrysosporium globiferum* var. *articulatum* Skou *var. nov.*

Etymology: '*articulatum*' from '*articulatus*' = jointed, out of joint referring to the fact that a large part of the hyphae becomes thick–walled without any considerable increase in diameter, and fall into pieces or single cells.

Descriptio ex varietatibus: *Hyphae 2.7 – 4.9 – 7.5 µm crassae. Pars conidia globosa ad subglobosam 87 pro 100, 5.9 – 8.0 – 11.4 µm magna et pars plus minusve pyriformis 13 pro 100, 7.1×8.0 – 7.7×9.6 – 10.8×13.1 µm magna, ratione longitudinis pro latitudine 1.25. Conidiae intercalares, thallis–arthricibus, praesentis, prodissimis articulatis in hyphis formatis sine diametro crescentibus, 3.5–7.7×4.1–14.0 µm magna, et alius cum diametro clare crescentibus minor conspique. Aliis characteribus idem ac Chrysosporium globiferum.*

Habitat in cibaria in indis Osmia cornifrontis (Radoszkowski).

Holotypus anno 1985 in cibaria Osmiae cornifrontis in regione Nagano, Japonia lectus per auctorem cultus, vivis prolibus in vivario Neerlandico Baarniensi sub numeris CBS 493.91 traditis et mycelio sporifero sicco typifico in Museo et Herbario Botanico Hauniensi (C) deposito.

Description of the variety: Hyphae 2.7 – 4.9 – 7.5 µm in diam. The globose to subglobose part of the conidia constitute 87% and is 5.9 – 8.0 – 11.4 µm, and the 13% more or less pyriform conidia is 7.1×8.0 – 7.7×9.6 – 10.8×13.1 µm with a length–to–width ratio of 1.25 (Figs 2 and 5g). The intercalary truncate, thallic–arthric, conidia are produced in hyphae both without any significant increase in diameter and a minor amount of truncate, thallic–arthric, conidia as in most of the other species. In the former case, the hyphae have a very pronounced tendency to fall apart in pieces or single cells that are 3.5–7.7×4.1–14.0 µm based on 100 measurements (Fig. 2). Intercalary conidia in the agar nearly exclusively single and rounded. Other characters and the growth conditions as in *C. globiferum*.

Habitat in provisions in nest cells of *Osmia cornifrons* (Radoszkowski).

Holotype anno 1985 collected in nests of *Osmia cornifrons* in bamboo canes in the Nagano region, Japan. Culture No. J 40 deposited at CBS, Baarn, The Netherlands with accession No. CBS 493.91. A dried culture of No. J 40 is chosen as holotype and deposited in the Botanical Museum and Herbarium, Copenhagen, Denmark (C).

The material examined consists of the culture from the above–mentioned collection (Skou, 1988).

11. *Chrysosporium globiferum* var. *niveum* Skou *var. nov.*

Etymology: '*niveum*' = snow white. The epithet is given as the fungus stands pure white on different media and may get a hint of colour on the reverse only in old cultures.

Descriptio ex varietatibus: *Hyphae 3.3 – 5.4 – 8.3 µm crassae, album. Coloniis niveis et reversus incolores ad fortasse dilute armeniascens in culturis veteribus. Pars conidia globosa ad subglobosam 64 pro 100, 5.6 – 7.9 – 10.3 µm et pars plus minusve pyriformis 36 pro 100, 5.0×6.9 – 7.2×8.7 – 9.0×10.7 µm magna cum ratione longitudinis pro latitudine 1.21. Aliis characteribus idem ac Chrysosporium globiferum.*

Habitat in cibariia in nidis Osmiae cornifrontis (Radoszkowski).

Holotypus anno 1985 in cibaria Osmiae cornifrontis in regione Nagano, Japonia lectus per auctorem cultus, vivis prolibus in vivario Neerlandico Baarnensi sub numeris CBS 455.91 traditis et mycelio sporifero sicco typifico in Museo et Herbario Botanico Hauniensi (C) deposito.

Description of the variety: Hyphae 3.3 – 5.4 – 8.3 µm in diam. and white. The colonies are snow white with an uncoloured reverse, which may get only a hint of apricot colour in aged cultures. The globose and subglobose part of the conidiae constitute 64% and is 5.6 – 7.9 – 10.3 µm, whereas the 36% more or less pyriform conidia is 5.0×6.9 – 7.2×8.7 – 9.0×10.7 µm with a length–to–width ratio of 1.21 (Figs

2 and 5h). Bunches of conidia not observed. Other characters are as those of *C. globiferum*.

Habitat in provisions in nest cells of *Osmia cornifrons* (Radoszkowski).

Holotype anno 1985 collected in nests of *O. cornifrons* in bamboo canes in the Nagano region, Japan. Culture No. J 46a deposited at CBS, Baarn, The Netherlands with accession No. CBS 455.91. A dried culture of No. J 46a is chosen as holotype and deposited in the Botanical Museum and Herbarium, Copenhagen, Denmark (C).

The material examined consists of two different cultures from the Japanese collections (Skou, 1988).

DISCUSSION

The term aleuriospore and chlamydospore have been used more or less interchangeably as noted by Barron (1968). Kendrick (1971) rejected aleuriospore as a confused term, and the present author regards it a superflous term, too, as it is necessary in any case to explain the kind of terminal conidia in question. In the present case, they are all holothallic with rhexolytic secession leaving a broad basal scar. The same holds for the sessile lateral conidia. Chlamydospore is a very general term which could be used for any of the conidia in the series of *Chrysosporium* species presented here without stretching the definition (Carmichael, 1971; Griffiths, 1974). For this reason chlamydospore is replaced with more specific terms in the present context in agreement with Cole & Samson (1979) and van Oorschot (1980).

The value may be discussed of visualizing the conidial differences in size and shape by presenting the measurements in systems of coordinates, and giving the proportions of globose to subglobose and the more or less pyriform conidia as these characteristics are more quantitative than qualitative. However, it contributes to differentiation of the species as it gives otherwise hidden information.

The new species of *Chrysosporium* presented are closely related with *C. farinicola* both in morphology and physiology, and so different from other described species that it is proposed to place them in a separate series. *C. xerophilum* Pitt (Pitt, 1966) does not fit into this series either in morphology or in physiology in relation to the type culture (CBS 153.67) as it appears to-day. Its morphology fully agrees with Pitt (1966) but it grows well on usual fungal media and not at all on concentrated media.

On the basis of microscopical observations on the provisions (pollen-and-nectar lumps), it is regarded very likely that the species belongs to *Bettsia* Skou teleomorphs as does *C. farinicola* to *B. alvei* (Betts) Skou. Obviously *C. sulphureum* (Friedl.) van Oorschot & Samson with sterile *Bettsia*-like fruiting structures (van Oorschot, 1980) belongs to the same teleomorph genus but the anamorph does not belong to the *Farinicola* series.

The few media used were regarded sufficient for differentiating the species by growth rate, gross-morphology and colour of avers and revers. On ordinary fungal media, the species grow only with very tiny traces or not at all. Growth is fast and excellent from 1 to above 3 molar glucose without a well-defined optimum and all the species grow on 3.6 molar glucose on standing but a profused growth initiates as the glucose crystallizes out from the supersaturated media. The aerial mycelium of *C. farinicola* and the new European species grow 1-2 mm high on these media as do also the Japanese species on the less concentrated media but the mycelium of these species grows higher on increasing glucose concentrations until 4–5 mm on 3 molar glucose.

Growth on NaCl media was very restricted compared with that on glucose media but they differentiated well between the species. Some species showed a very faint growth on 0.125 molar (7.3 g/l) NaCl. Most of the species had optimal growth on 1 molar NaCl and the others on 0.5 molar. Further, some species were able to grow on 2 molar NaCl.

The availability of water, the water activity, depends on, but not proportional to, the molecular or ionic concentration (Money & Born, 1951; Griffin, 1977, 1981; Rockland & Beuchat, 1987) so the water activity may be lower on media with 2 molar NaCl than it is on 3.6 molar glucose which was the most concentrated solution it was possible to make. Comparable results with the effect of glucose and NaCl concentrations on *Wallemia sebi* (Fr.) v. Arx (syn. *Sporendonema epizoum* (Corda) Cif. & Red.) show a higher optimum on NaCl and a lower on glucose (Ormerod, 1967) than that found in the *Chrysosporium* species described here.

The reason for the somewhat lower growth rate on SDA–20 might well be – for this series of fungi – the relative low concentration of glucose. The colonies of *C. farinicola* form flat–spreading colonies on this medium; those of the new European species are likewise flat but with a more or less wrinkled surface, and those of the Japanese species are more or less dome–shaped and recaved with a velvety surface. These differences seem to be caused by the intensity of intramatricular growth in the agar that may be so strong in the dome–shaped colonies that the agar bursts.

Growth and formation of conidia in the agar is very suitable for differentiation between the species though it is more or less a reflection of that occurring on the air mycelium. The difference in appearance between growth in air and in agar is small in *C. farinicola* apart from the fact that the intercalary truncate conidia alternate with a number of rounded to globose conidia. The latter shape of intercalary conidia is almost exclusively present in all the other species in cases where this type of conidia is present in the agar. Only terminal conidia occur on *C. farinicola* and on the new European species in the agar with 3 molar and higher concentrations of glucose. The Japanese species do not produce conidia in the agar on these concentrated media.

Water potential, osmotic pressure, water activity and the related terms have been a matter of discussion (cf. *e.g.* Money & Born, 1951; Pitt & Christian, 1968; Pitt, 1975; Brown, 1976; Griffin, 1977, 1981). From all what I have encountered in my experiments over the years, I find it is better to base the terms on what is required for growth and reproduction than to set up fixed criteria. *Bettsia alvei* requires 250 g honey per litre to give a fairly good production of spore cysts (Skou, 1972) and the requirements of its anamorph, *C. farinicola*, are well known (Pitt, 1966, 1975; Pitt & Christian, 1968; Skou, 1972, 1975) and further circumscribed here. Later, when I identified *Ascosphaera osmophila* Skou & King, it was found that this fungus grows but does not form spore cysts on ordinary fungal media whereas fructification was fairly high on 10–50% glucose with an optimum of about 20%. Further, it was clear that the same concentration of disaccharides gave a reduced formation of spore cysts, and starch gave only a voluminous mycelial growth and few spore cysts. These facts made it reasonable to name the fungus "*osmophila*" (Skou & King, 1984). During the investigation of the *Ascosphaera* material collected in Japan, it was observed that a number of cells in several mycelia exploded when grown on less–concentrated media.

The phenomenon disappeared at high glucose concentrations and one of the cultures produced spore cysts only at 60% glucose. This made it reasonable to name the fungus *A. xerophila* Skou (Skou, 1988). It is because of such absolute requirements that I find the *Farinicola* series of *Chrysosporium* species exceptional xerophilic. A detailed description of the strongness of the xerophily involves several parameters and requires further experiments (cf. Griffin, 1981).

Nectar normally contains large amounts of sucrose but if the mason bees (*Osmia* species) like the honey bees produce invertase, it is very likely that the sugar in the provisions consists of invertsugar and thereby constitutes a higher molecular concentration.

The occasional occurrence of the highly xerophilic *Wallemia sebi* together with the *Chrysosporium* species further indicate the concentrated nature of the provisions.

It is difficult to explain why some lumps of provisions have been left uneaten, but we must consider that the presented *Chrysosporium* species may leave the pollen diet worthless as do the pollen mould (*C. farinicola* alias *B. alvei*) in the case of the honey bees.

The presented *Chrysosporium* species give off a fruity smell during growth that may turn cheesey on standing for a long period at room temperature. A smell that has also been notised by Kinderlerer (1984).

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REFERENCES

Barron, G.L. 1968. The Genera of Hyphomycetes from Soil. 364 p. Williams & Wilkins Co., Baltimore, U.S.A.

Brown, A.D. 1976. Microbial water stress. Bact. Rev. *40*, 803–846.

Burnside, C.E. 1928. Saprophytic fungi associated with the honey bee. Mich. Acad. Sci. Arts Letters *8*, 59–86.

Carmichael, J.W. 1956. The cellophane technique for studying morphology and hyphal fussions in fungi. Mycologia *48*, 450–453.

Carmichael, J.W. 1962. *Chrysosporium* and some other aleuriosporic hyphomycetes. Can. J. Bot. *40*, 1137–1173 + VII plates.

Carmichael, J.W. 1971. Blastospores, aleuriospores, chlamydospores. In Bryce Kendrick (ed.): Taxonomy of *Fungi imperfecti*. pp. 50–70. Univ. Toronto, Canada.

Cole, G.T. & R.A. Samson. 1979. Patterns of Development in Conidial Fungi. 190 p. Pitman, London, U.K.

Griffin, D.H. 1977. Water potential and wood–decay fungi. Ann. Rev. Phytopathol. *15*, 319–329.

Griffin, D.H. 1981. Fungal Physiology. 354 p. Van Nostrand Co., Inc. New Jersey.

Griffiths, D.A. 1974. The origin, structure and function of chlamydospores in fungi. Nova Hedwigia *25*, 503–547.

Kendrick, B. 1971. Conclusions and recommendations. In Bryce Kendrick (ed.): Taxonomy of *Fungi imperfecti*. pp. 253–262. Univ. Toronto, Canada.

Kinderlerer, J.L. 1984. Spoilage in desiccated coconut resulting from growth of xerophilic fungi. Food Microbiol. *1*, 23–28.

Kreger–van Rij, N.J.W. (ed.). 1984. The Yeasts, a Taxonomic Study. 1082 p. Elsevier Sci. Publ. B.V., Amsterdam.

Money, R.W. & R. Born. 1951. Equilibrium humidity of sugar solutions. J. Sci. Agric. *2*, 180–185.

Oorschot, C.A.N. van. 1980. A Revision of *Chrysosporium* and Allied Genera. Stud. Mycol. No. *20*, 1–89, CBS, Baarn, The Netherlands.

Ormerod, J.G. 1967. The nutrition of the halophilic mould *Sporendonema epizoum*. Arch. Microbiol. *56*, 31–39.

Pitt, J.I. 1966. Two new species of *Chrysosporium*. Trans. Br. mycol. Soc. *49*, 467–470.

Pitt, J.I. 1975. Xerophilic fungi and the spoilage of foods of plant origin. In R.B. Duckworth (ed.): Water Relations of Foods. 716 p. Acad. Press, London, U.K.

Pitt, J.I. & H.B. Christian. 1968. Water relations of xerophilic fungi from prunes. Appl. Microbiol. *16*, 1853–1858.

Punithalingam, E. 1971. *Bacidiomycetes: Heterobasidiomycetidae*. In C. Booth (ed.): Methods in Microbiology Vol. *4*, 193–218, Acad. Press, London, U.K.

Rockland, L.B. & L.R. Beuchat (eds), 1987. Water Activity: Theory and Application to Food. IFT Basic Symp. Series. Proc. Tenth Basic Symp. Dallas, Tex. June 13–14, 1986. Marcel Dekker, Inc. New York.

Skou, J.P. 1972. Ascosphaerales. Friesia *10*, 1–24.

Skou, J.P. 1975. Two new species of *Ascosphaera* and notes on the conidial state of *Bettsia alvei*. Friesia *11*, 62–74.

Skou, J.P. 1984. *Ascosphaera osmophila sp. nov.* An Australian spore cyst fungus. Austr. J. Bot. *32*, 225–231.

Skou, J.P. 1986. Notes on habitats, morphology and taxonomy of spore cyst fungi. Apimondia *30*, 260–264.

Skou, J.P. 1988. Japanese species of *Ascosphaera*. Mycotaxon *31*, 173–190.

Skou, J.P. 1990. Xerophilic *Chrysosporium* species associated with solitary bees. 4. Intern. Mycol. Congr., Regensburg, Germany, 28 Aug.–3 Sept. 1990. Abstr. IA–54/3.

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CERCOSPORA OSIRISAE SP. NOV., THE CAUSE OF A SPOT DISEASE ON EMERSED LEAVES OF ECHINODORUS OSIRIS IN FLORIDA

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ABSTRACT

Leaf spots on emersed leaves of Echinodorus osiris (family: Alismataceae) were examined and a fungus characteristic of the genus Cercospora was noted sporulating on the necrotic tissues. Single spore isolates were established. The morphological features of this fungus were compared to all of the described Cercospora spp. from members of the Alismataceae and closely related families. Stromata were lacking. The conidiophores (medium brown) were 42-318 µm in length, multiseptate (up to 12), and geniculate (up to 6). The hyaline or subhyaline conidia were 5 x 18-129 µm in size and were distinctly septate (mostly 3-7). This combination of traits did not match any of the described Cercospora spp. from the Alismataceae and closely related plant families, so a new species, Cercospora osirisae is proposed.

KEY WORDS: Cercospora osirisae, Echinodorus osiris, leaf spot disease.

INTRODUCTION

Echinodorus osiris Rataj (melon sword plant), a member of the Alismataceae, is native to southern Brazil. Due to its coloration, *E. osiris* is often cultivated as a decorative plant for indoor aquaria (13). Recently, we found a species of *Cercospora* sporulating on spots of emersed *E. osiris* leaves. Submersed leaves of diseased plants were free of lesions. The individual circular to irregular leaf spots ranged from less than 1 mm to 14 mm in diameter. Spots were medium brown, necrotic, with a chlorotic halo. Some spots coalesced to form larger necrotic areas which were not vein delimited (Fig. 1). It was apparent to us from the characteristics of this fungus that it was unlike *C. echinodori* Chupp that was described on *E. cordifolius* (L.) Griseb. (3). The object of this study was to compare the fungus from *E. osiris* to all species of *Cercospora* that have been reported from members of the plant family Alismataceae and closely related families in the order Helobiae.

MATERIALS AND METHODS

Samples of *E. osiris* with necrotic leaf spots were submitted to our plant pathology laboratory in 1990. The infected leaves were placed in a moist chamber at room temperature (25 ± 2C) under ambient laboratory conditions for 2 days to enhance sporulation. A leaf spot from which sporulation occurred was aseptically cut out and placed in a sterile test tube containing 2 mL of sterile deionized water. The test tube containing the sporulating leaf spot was then shaken on a Vortex mixer at high speed for 1 min to release conidia. From this water suspension, we were able to obtain cultures from single conidia by the method of Hansen and Smith (8). A total of 26 monoconidial cultures were grown on acidified potato dextrose agar (APDA, pH 4.3) to compare colony morphology. APDA was prepared from the broth of 200 g of freshly peeled, diced, and boiled Irish potatoes (*Solanum tuberosum* L.) supplemented with 20 g dextrose, 1 g KH_2PO_4, and 18 g Difco Bacto agar, and made up to 1 L with deionized water. After cooling, 1.4 mL of 50% lactic acid was added per 1L of autoclaved medium to obtain a pH of 4.3. All 26 cultures were subcultured on carnation (*Dianthus caryophyllus* L.) leaf segments (5x5 mm) on water agar (CL/WA) to enhance sporulation (14). CL/WA was prepared as described by Fisher et al. (7).

All 26 subcultures on CL/WA were grown at room temperature for 2 days and were exposed to continuous fluorescent light (GE F20 T12-CW) at an intensity of approximately 3000 lux for 6 additional days.

Water-mounted conidiophores and conidia were photographed. Microscopic examinations and measurements were made at 400 and 1000 x.

Morphological characteristics were compared to the published descriptions of all Cercospora spp. from members of the Alismataceae and closely related families.

RESULTS AND DISCUSSION

Fungal sporulation was amphigenous on its natural host. Stromata were lacking, but unorganized hyphal strands were occasionally observed below the fascicles of conidiophores. Of 79 fascicles examined, the number of conidiophores per fascicle was (6-)13(-22). Conidiophores were geniculate (0-6, rarely more), multiseptate (up to 12 septa or more), medium brown, long, occasionally branched, and fairly even in width (Figs. 2 & 3). At midpoint, conidiophore width measured (3.5-)4.9(-6.0) µm. Conidiophore length varied from 42 to 318 µm or longer. Conidia were hyaline or subhyaline, straight or slightly curved (Fig. 4), and septate (up to 12 septa per conidium). The most frequently observed conidia had 3-7 septa (Table 1). Conidial scars were conspicuous and thickened (Fig. 4). Conidiophore scars also showed a distinct thickening (Fig. 3). Within 5 days on CL/WA, conidia were longer than those on the host (up to 367 µm) and had more septa. Conidia from culture were about the same width as those from the host plant

The fungus grew very slowly on APDA. The average colony diameter was 9-10 mm after 18 days at 25 ± 2 C. On APDA, fungal colonies were gray to black as viewed from above and black as viewed from below.

The combined morphological features of this species of Cercospora are different from all reported species of Cercospora known to infect the Alismataceae (Table 2) and closely related families.

TABLE 1. Conidia measurements of Cercospora osirisae

No. of septa	Conidia Measured	% of total	Length, µm	Width (widest), µm
0	2	0.6	(32.7-)38.2(-43.6)	(3.8-)4.2(-4.5)
1	11	3.4	(18.2-)39.0(-62.4)	(3.5-)4.5(-5.9)
2	20	6.2	(23.8-)42.8(-62.4)	(3.0-)4.3(-5.9)
3	44	13.5	(23.8-)51.1(-91.1)	(3.0-)4.7(-7.1)
4	48	14.8	(36.6-)65.2(-115.3)	(3.2-)4.9(-7.0)
5	54	16.6	(39.1-)71.8(-114.5)	(4.0-)5.3(-8.9)
6	58	17.9	(56.4-)78.4(-105.9)	(3.2-)5.1(-8.2)
7	47	14.5	(55.5-)85.4(-119.3)	(3.5-)5.0(-6.9)
8	24	7.4	(74.8-)94.6(-127.0)	(4.0-)5.4(-7.7)
9	7	2.2	(94.1-)98.8(-115.8)	(4.7-)5.1(-5.5)
10	7	2.2	(82.2-)107.2(-129.2)	(4.2-)4.9(-5.4)
11	2	0.6	(117.8-)121.2(-124.5)	(4.5-)4.8(-5.0)
12	1	0.3	111.9	5.0

TABLE 2. Comparison of Cercospora spp. that infect the Alismataceae

Species	Stromata (µm)	Conidiophores (µm)	Conidia (µm)
Cercospora osirisae	lacking	3.5-6x42-318 or more, occasionally branched, multiseptate (up to 13 septa), 0-6 geniculate, rarely more	(3-)5(-8.9)x18-129, up to 12 septa (mostly 3-7)
Cercospora alismatis Ellis & Holw.	30-40 dia.	4-7x15-175, occasionally branched, multiseptate, 0-2 geniculate	3-6x50-160 5-9 septate
Cercospora callae Peck & G. W. Clinton	not large	4.5-5.5x55-135, not branched, multiseptate, medium to much geniculation or closely sinuous	5-8x25-110, 2-9 septate
Cercospora echinodori Chupp	15-40 dia.	2.5-6.5x15-65, not branched, sparingly septate, not geniculate	2.5-5x45-125 indistinctly multiseptate
Cercospora sagittariae Ellis & Kellerm.	lacking	4.5-7x20-60, rarely 100 in length, not branched, sparingly septate, 1-2 geniculate	3-5x25-150 4-6 septate

Cercospora osirisae does not produce stromata, while C. alismatis, C. callae, and C. echinodori are stromatic (3,5,6,11). Conidiophores of C. osirisae measure up to 318 µm or more in length, while those of C. sagittariae measure up to 60 µm, rarely 100 µm in length. Conidiophores of C. osirisae are geniculate (up to 6, rarely more), while those of C. sagittariae show no more than 2 geniculations. Conidia of C. osirisae have up to 12 septa, while those of C. sagitariae have no more than 6 septa.

Cercospora osirisae was also compared to all of the described Cercospora spp. from members of plant families that are closely related to the Alismataceae: Aponogetonaceae, Butomaceae, Hydrocharitaceae, Liliaceae, Najadaceae, Potamogetonaceae, and Scheuchzeriaceae. All these families are in the order Helobiae. There were no reports of Cercospora spp. from the Butomaceae, Najadaceae, Potamogetonaceae, and Scheuchzeriaceae. Thirty seven species of Cercospora have been reported from the Liliaceae (1,2,3,9,15), one species (C. aponogetonicola M. S. Pravgi & L. Singh) from the Aponogetonaceae (10), and one species (C. limnobii Conway) from the Hydrocharitaceae (4). Of 37 Cercospora spp. that have been reported from the Liliaceae, C. hostae Hori ex Katsuki specimen was not found to be preserved (3,12), 8 species were redisposed (3,12), and 28 were stromatic (1,2,3,9,15). Cercospora osirisae does not produce a stroma. This leaves C. togashiana Katsuki. Stromata are lacking in C. togashiana (3). Conidiophores of C. togashiana are curved to sharply bent, occasionally constricted at septa, and slightly geniculate (3). Conidiophores of C. osirisae are geniculate (up to 6), not bent, and not constricted at septa. Conidia of C. togashiana are cylindric to obclavate, 3-8 septate (3). Conidia of C. osirisae are not cylindrical and have up to 12 septa.

Cercospora aponogetonicola and C. limnobii are stromatic (4,10). Stromata are lacking in C. osirisae.

We propose here the following new species:

Cercospora osirisae El-Gholl, Proffer, et Schubert, sp. nov.

Maculae mortuae in foliis, bruneolae, circulares usque ad irregulares, 1-14 mm diametro, halonatae colore flavo. Sine stromatibus. Conidiophora bruneola, (6-)13(-22) in quoque

fasciculo, longa (usque ad 318 μm aut longiora), ramosa interdum, plana generaliter latitudine (3.5-)4.9(-6.0)μm ad centrum, multiseptata (usque ad 12 septa aut plura), et 0-6 geniculata. Cicatrices conidiophororum manifeste incrassatae. Conidia hyalina aut subhyalina, recta aut parum curvata, septata (1-)3-7(-12). Cicatrices conidiorum conspicuae et crassae. Amplitudines conidiorum per 3-, 4-, 5-, 6-, et 7-septata conidia (23.8-)51.1 (-91.1)x(3.0-)4.7(-7.1)μm, (36.6-)65.2(115.3)x(3.2-)4.9(-7.0)μm, (39.1)71.8(-114.5)x(4.0-)5.3(-8.9)μm, (56.4-)78.4(-105.9)x(3.2-)5.1 (-8.2)μm, et (55.5-)85.4(-119.3)x(3.5-)5.0(-6.9)μm, in ordinem.

HABITAT: Sejuncta e maculis in foliis Echinodori osiris emersis ex aqua.

LOCUS HUIUS HOLOTYPI: Ft. Lauderdale, Florida, U.S.A.

HOLOTYPUS: FLAS F55631, June 1990, ATCC 76111

Medium brown, circular to irregular necrotic leaf spots, 1-14 mm diameter, with chlorotic halo. Stromata lacking. Conidophores medium brown, (6-)13(-22) per fascicle, long (up to 318 μm or longer), occasionally branched, fairly even in width (3.5-)4.9(-6.0) μm at midpoint, multiseptate (up to 12 septa or more), and 0-6 geniculate. Conidiophore scars with distinct thickening. Conidia hyaline or subhyaline, straight or slightly curved, septate (1-)3-7 (-12). Conidial scars conspicuous and thickened. Conidial sizes for the 3-, 4-, 5-, 6-, and 7-septate conidia (23.8-)51.1(-91.1)x (3.0-)4.7(-7.1)μm, (36.6-)65.2(-115.3)x(3.2-)4.9(-7.0)μm, (39.1-)71.8 (-114.5)x(4.0-)5.3(-8.9)μm, (56.4-)78.4(-105.9)x(3.2-)5.1(-8.2)μm, and (55.5-)85.4(-119.3)x(3.5-)5.0(-6.9)μm, respectively.

HABITAT: Isolated from leaf spots on emersed leaves of Echinodorus osiris.

TYPE LOCALITY: Ft. Lauderdale, Florida, U.S.A.

HOLOTYPE: FLAS F55631, June 1990, ATCC 76111

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REFERENCES

1. BALFOUR-BROWNE, F. L. 1951. *Cercospora narthecii* sp. nov. Transactions and Proceedings of the Botanical Society of Edinburgh 35:434.
2. BATISTA, A. C., BEZERRA, J. L., and PERES, G. E. P. 1965. *Cercospora riofranciscana* n. sp. in Batista et al., Publicações Instituto de Micologia, Universidade de Recife, Brazil, 450:9-10.
3. CHUPP, C. 1953. A monograph of the fungus genus *Cercospora*. Cornell Univ., Ithaca, New York. 667 p.
4. CONWAY, K. E. 1978. A new species of *Cercospora* from *Limnobium spongia*. Transactions of the British mycological Society 71:521-523.
5. ELLIS, J. B., and HOLWAY, E.W.D. 1885. *Cercospora alismatis* n.s. Journal of Mycology 1:63.
6. ELLIS, J. B., and KELLERMAN, W. A. 1886. *Cercospora sagittariae* n.s. Journal of Mycology 2:1-2.
7. FISHER, N. L., BURGESS, L. W., TOUSSOUN, T. A., and NELSON, P. E. 1982. Carnation leaves as a substrate and for preserving cultures of *Fusarium* species. Phytopathology 72:151-153.
8. HANSEN, H. N., and SMITH, R. E. 1932. The mechanism of variation in imperfect fungi: *Botrytis cinerea*. Phytopathology 22:953-964.
9. PATWARDHAN, P. G., and SATHE, A. V. 1965. *Cercospora iphigeniae* spec. nov. Sydowia 19:151-152.
10. PAVGI, M. S., and SINGH, L. 1977. *Cercospora aponogetonicola* sp. nov. Hydrobiologia 53:89.
11. PECK, C. H., and CLINTON, G. W. 1876. *Cercospora callae* n. sp. New York State Museum of Natural History Report 29:52.

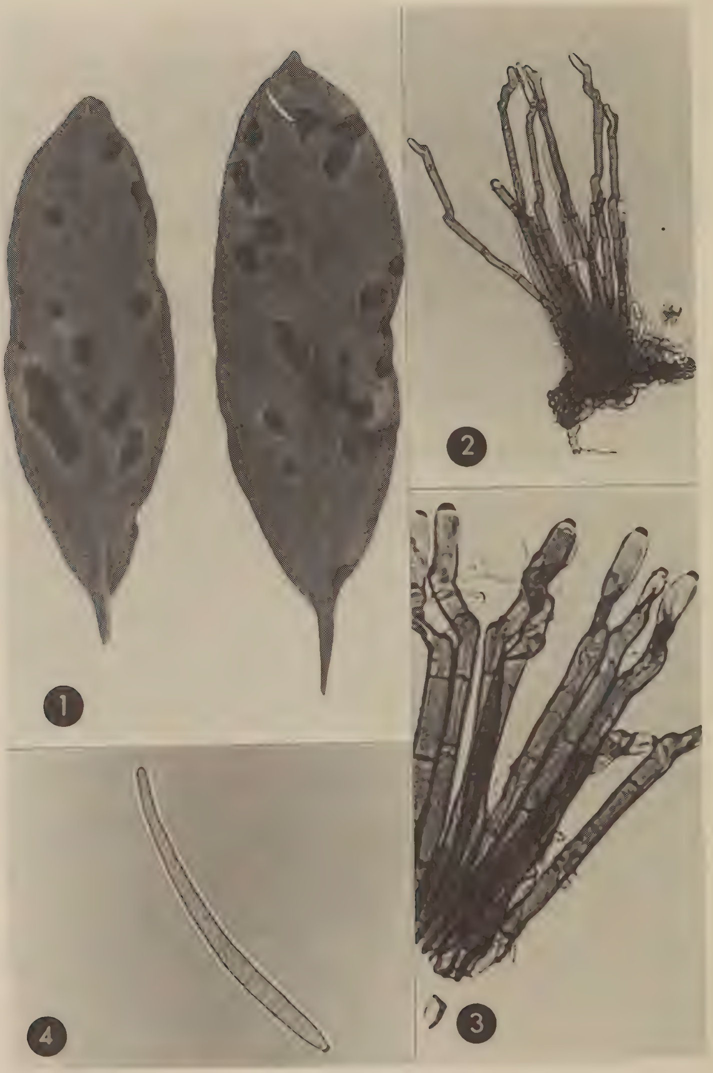
12. POLLACK, F. G. 1987. An Annoted Compilation of Cercospora Names. Mycologia Memoir No. 12. J. Cramer, Berlin. 212p.

13. RATAJ, K. 1970. New species of the genus Echinodorus from south Brazil. Folia Geobotanica et Phytotaxonomica 5:213-216.

14. SNYDER, W. C., and HANSEN, H. N. 1947. Advantages of natural media and environments in the culture of fungi. Phytopathology 37:420-421.

15. YEN, JO-MIN, and LIM, G. 1969. Cercospora gloriosicola n. sp. Bulletin trimestriel de la Société Mycologique de France 85:467-469.

Contribution No. 664, Bureau of Plant Pathology, Gainesville, FL



Figs. 1-4. *Cercospora osirisae*. 1. Spots on lower (left) and upper (right) surfaces of fully expanded emersed leaves of *Echinodorus osiris* caused by *C.osirisae* under natural conditions, x 1.0. 2. Fascicle of conidiophores, x 289. 3. Conidiophore scars with distinct thickening, x 578. 4. Conidium of *C. osirisae* showing a thickened scar, x 578.

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IDRIELLA SPECIES ENDOPHYTIC IN PALMS

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During a survey of endophytic fungi in leaves of the palm *Euterpe oleracea* Mart., three new species of *Idriella* were isolated. This is the third report of endophytic fungi found in palms. Rodrigues and Samuels (1990) described endophytes of the Australian fan palm *Licuala ramsayi*, including the new species *Idriella licualae* Rodrigues & Samuels. Rodrigues (In press) found several endophytic fungi in healthy leaflets of *E. oleracea*. In the present report we describe as new three endophytic species of *Idriella* from *E. oleracea*.

Leaves of the palm were collected in January and September 1989 in floodplains of the Brazilian Amazon, located at Combu Island, near Belém (01°28'S, 48°27'W) in Pará state. Samples were carried in polyethylene bags to the Laboratory of Phytopathology of EMBRAPA (Brazilian Agricultural Research Organization)/CPATU (Center of Agricultural Research for the Humid Tropics), where they were processed within 24 hours of collecting.

Leaves were surface sterilized following a technique modified from Petrini (1986), by immersing them in 75% ethanol for 1 min., followed by 65% domestic bleach (Brillux, 5% sodium hypochlorite) for 10 min, and 75% ethanol for 30 sec. Discs of approximately 3 mm diam were cut and placed into 8.5 cm diam Petri dishes containing cornmeal dextrose agar (CMD, Difco) supplemented with 4 g/l Streptomycin sulfate, and 5 mg/l of Cyclosporine A (CsA, Sandoz) which retards the development of fast growing fungi (Dreyfuss, 1986). Colonies that grew from the discs were then isolated onto culture tubes containing cornmeal agar (CM, Difco), and transported to the New York Botanical Garden for further studies.

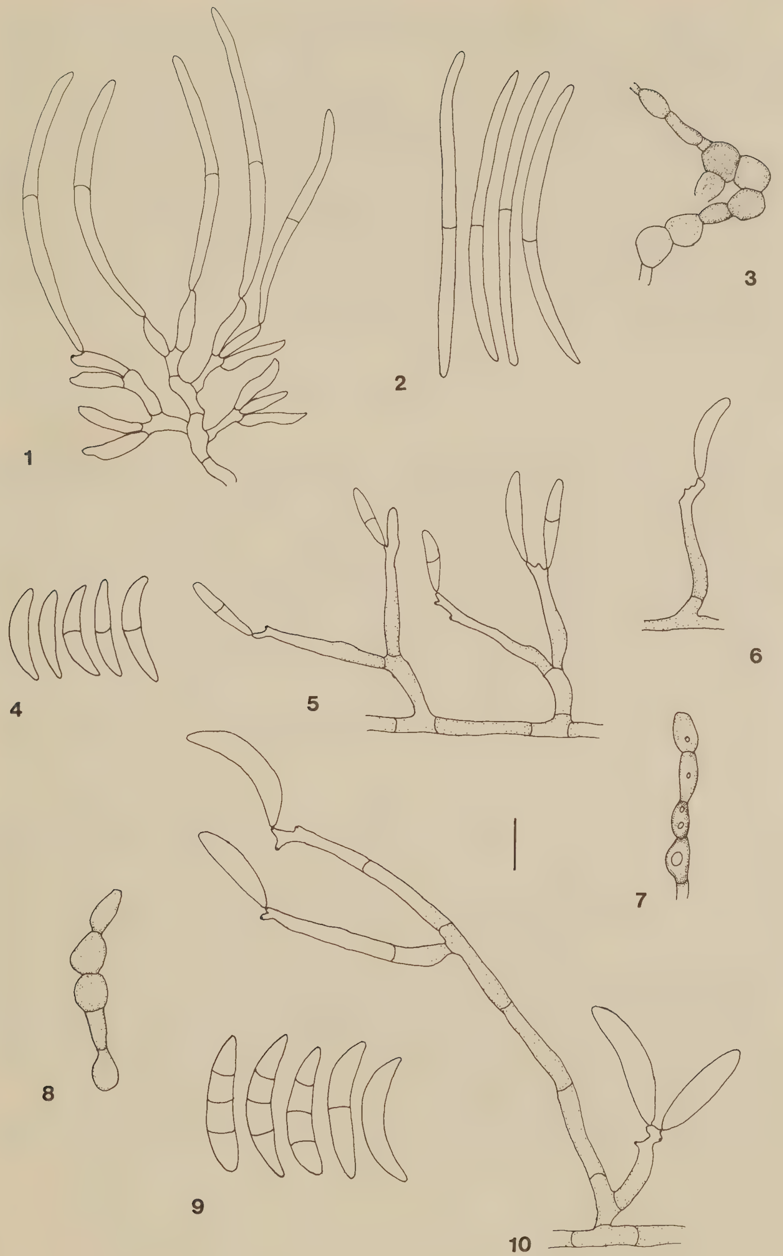
Morphological characteristics of the current taxa were studied on 8.5 cm diam plastic Petri dishes containing potato dextrose agar (PDA, Difco) and incubated at 20°C, with 12 h cool white fluorescent light, and 12 h darkness. All cultures are deposited in the New York Botanical Garden; representative isolates are deposited in the American Type Culture Collection.

Idriella euterpes K. F. Rodrigues & Samuels, *sp. nov.* Figs. 1-3

Coloniae opacae, gossypinae, azonatae, pallide aurantiacae vel aurantiacae, margine fimbriatae. Reversus pallide aurantiacus. Conidiophora ramosa, hyalina, 18.0-26.1 x 2.7 μm. Cellulae conidiogenae lageniformes, hyalinae, monoblasticae vel sympodialiter proliferantes. Conidia falcata, hyalina, 0-1-septata, (31.5-)37.9-65.3(-72.0) x (1.4-)1.6-2.6(-3.3) μm. Chlamydosporae intercalares, subglobosae, subhyalinae vel brunnescentes, 6.6-8.8 μm.
In foliis vivis *Euterpes oleraceae* Mart., Bélem, Brasil.
Holotypus: KFR 91-285 (NY)

Colony 4.5 cm diam in 5 days at 20 C, cottony, azonate, pale orange to orange; margin fringed. Colony reverse pale orange, agar radially splitting. Conidiophores branched, hyaline, 18.0-26.1 x 2.7 μm, produced on orange sporodochia, abundantly formed in the center of colony. Conidiogenous cells lageniform, hyaline, monoblastic or sympodially proliferating. Conidia falcate, (38.7-)45.5-63.1(-64.8) x (1.4-)1.6-2.6(-3.3) μm, 0-1-septate, hyaline. Chlamydospores intercalary, sub-globose, sub-hyaline to brownish, 6.6-8.8 μm broad.
Holotype: KFR 91-285 (NY)

Figs. 1-3. *Idriella euterpes*. 1. Conidiophore. 2. Conidia. 3. Chlamydospores. Figs. 4-7. *I. asaicola*. 4. Conidia. 5. Branched conidiophores. 6. Solitary conidiophore. 7. Chlamydospores. Figs. 8-10. *I. amazonica*. 8. Chlamydospores. 9. Conidia. 10. Conidiophore. Scale bar = 10 μm.



Idriella euterpes is morphologically close to *Idriella* sp. *MFC-4867* (Matsushima, 1975), but differs in having much longer conidia. Matsushima (1975) noticed a similarity between this species and *Microdochium caespitosum* (Sutton et al., 1972). Similarity between these two genera has already been pointed out by Sutton et al. (1972), which led Arx (1981) to redefine the generic concept of *Idriella* and *Microdochium*. Species of both genera have been linked to teleomorphs, the former having been linked to *Monographella* Petrak (Samuels and Hallett, 1983), and the latter to *Hymenoscyphus* Gray (Kimbrough and Atkinson, 1972) and *Dothiopeltis* Müller (Crivelli and Müller, 1983). Our isolates did not produce a teleomorph.

Idriella asaicola K. F. Rodrigues & Samuels, *sp. nov.* Figs. 4-7

Coloniae opacae, appressae, caespites albos ad centrum ferentes, azonatae, primum subsalmoneae, maculas brunneas e centro extrinsecus producentes, margine incolores. Reversus brunneus. Cellulae conidiogenae denticulatae, sympodiales, caespites insidentes. Conidiophora simplicia vel ramosa, hyalina, tum luteo-brunnea, 27.9-63.9 x 1.8-2.7 μm. Conidia lunata, hyalina, 0-1-septata, (11.6-)12.0-16.3(-20.7) x (2.7-)2.5-3.3(-3.6) μm, in cultura pura germinantia. Chlamydosporae intercalares vel terminales, ellipticae vel subglobosae, brunneae, guttulatae.
In foliis vivis *Euterpes oleraceae* Mart., Bélem, Brasil.
Holotypus: KFR 90-143 (NY).

Colony 5.5 cm diam in 5 days at 20 C, opaque, appressed with scattered white tufts in the center, azonate, pale salmon, then forming brown patches from the center outwards; margin colorless. Color reverse brown. Conidiophores solitary, to 30 μm long, or branched, hyaline first, then yellowish brown, 27.9-63.9 x 1.8-2.7 μm, produced on tufts. Conidiogenous cells denticulate, sympodial. Conidia lunate, (11.6-)12.0-16.3(-20.7) x (2.7-)2.5-3.3(-3.6) μm, 0-1-septate, hyaline. Chlamydospores intercalary to terminal, ellipsoidal to subglobose, brown, guttulate, 4.5-6.3 μm broad.
Holotype: KFR 90-143 (NY).

Idriella asaicola does not resemble any described species of *Idriella*.

Idriella amazonica K. F. Rodrigues & Samuels, *sp. nov.* Figs. 8-10

Coloniae opacae, mycelio aereo sparso, centro radialiter sulcatae, azonatae, pallide aurantiacae tum e centro extrinsecus fuscescentes, margine incolores. Reversus pallide brunneus, agare radialiter vadose fisso. Cellulae conidiogenae denticulatae, sympodiales, structuras mucosas pallide aurantiacas demum fuscescentes insidentes. Conidiophora ramosa, subhyalina vel brunnea, 28.8-31.5-45.0 x 2.7-3.6 μm. Conidia lunata, subhyalina vel brunneo-olivacea, 0-3-septata, (18.0-)20.0-26.0(-27.0) x (3.5-)3.7-4.6(-4.5) μm. Chlamydosporae intercalares vel terminales, ellipticae vel subglobosae, brunneae.
In foliis vivis *Euterpes oleraceae* Mart., Bélem, Brazil.
Holotypus: KFR 90-154 (NY).

Colony 5 cm diam in 5 days at 20°C, opaque; aerial mycelium scant, radially furrowed at center, azonate, pale orange then darkening to brown from the center outwards; margin colorless. Colony reverse light brown, agar shallowly splitting in a radial pattern. Conidiophores branched, sub-hyaline to brown, 28.8-31.5-45.0 x 2.7-3.6 μm, produced on pale orange sporodochia which becomes dark brown when colony ages. Conidiogenous cells denticulate, sympodial. Conidia lunate (18.0-)20.0-26.0(-27.0) x (3.5-)3.7-4.6(-4.5) μm, 0-3 septate, sub-hyaline to olive brown. Chlamydospores intercalary to terminal, elliptical to subglobose, brown, 6.3-9.0 μm broad.
Holotype: KFR 90-154 (NY).

Idriella ramosa Matsushima (Matsushima, 1971) has 0-3-septate conidia but it differs from *I. amazonica* in the branching pattern of its conidiophores and in its larger conidia.

KEY TO IDRIELLA SPECIES ENDOPHYTIC IN PALMS

1. Colony dark brown; conidia 0-septate, (15.4-)16.7-22.2(-23.1) x (2.2-)1.8-3.2(-4.4) μm; in *Licuala ramsayi* .... *I. licualae*
1. Colony pale orange to brownish; in *Euterpe oleracea* 2
    2. Sporodochia not produced; conidia 0-1 septate, 11.6-20.7 x 2.7-3.6 μm .... *I. asaicola*
    2. Sporodochia produced 3

3. Conidia 0-1 septate, 38.7-64.8 x 1.4-3.3 μm .... *I. euterpes*
3. Conidia 0-3 septate, 18.0-27.0 x 3.5-4.5 μm .... *I. amazonica*

ACKNOWLEDGMENTS

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LITERATURE CITED

Arx, J. A. von. 1981. Notes on *Microdochium* and *Idriella*. *Sydowia* 34: 30-38.

Crivelli, P., and E. Müller. 1983. Über *Dothiopeltis arunci* und sein Anamorph (Ascomycetes). *Bot. Helv.* 93: 33-37.

Dreyfuss, M. M. 1986. Neue Erkenntnisse aus einem pharmakologischen Pilz-screening. *Sydowia* 39: 22-36.

Kimbrough, J. W., and M. Atkinson. 1972. Cultural features and imperfect stage of *Hymenoscyphus caudatus*. *Amer. J. Bot.* 59: 165-171.

Matsushima, T. 1971. *Microfungi of Solomon Islands and Papua-New Guinea.* Published by the author, Kobe.

______. 1975. *Icones microfungorum a Matsushima lectorum.* Published by the author, Kobe.

Petrini, O. 1986. Taxonomy of endophytic fungi of aerial plant tissues. *In:* N. Fokkema and J. van den Heuvel (eds.), *Microbiology of the Phyllosphere.* Cambridge University Press, Cambridge.

Rodrigues, K. F. (In Press). Fungos endofiticos em *Euterpe oleracea* Mart., com enfase em Xylariaceae. *Bol. Mus. Paraense Hist. Nat.*

______, and G. J. Samuels. 1990. Preliminary study of endophytic fungi in a tropical palm. *Mycol. Res.* 94: 827-830.

Samuels, G. J., and I. C. Hallett. 1983. *Microdochium stoveri* and *Monographella stoveri*, new combinations for *Fusarium stoveri* and *Micronectriella stoveri*. *Trans. Brit. Mycol. Soc.* 81: 473-483.

Sutton, B. C., K. A. Pirozynski, and F. C. Deighton. 1972. *Microdochium* Syd. *Canad. J. Bot.* 50: 1849-1907.

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THALLUS SURFACES IN COCCOCARPIACEAE AND PANNARIACEAE (LICHENIZED ASCOMYCETES) VIEWED WITH SCANNING ELECTRON MICROSCOPY

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ABSTRACT: The thallus surfaces of species belonging to the Coccocarpiaceae and Pannariaceae were studied using scanning electron microscopy (SEM). A pored epicortex was shown in *Coccocarpia ssp.*, *Degelia gayana* and *D. plumbea*. In the other species studied no definite pores were found. The probable systematic significance of a pored epicortex in this group is shortly discussed.

In a group of the Parmeliaceae, the parmotremoid Parmelias, the presence of pores in an acellular epicortical layer, which is called epicortex, is well documented (Hale 1981). Hale *(loc. cit.)* emphasized the systematic importance of the pored epicortex in the Parmeliaceae *s.str.* He could show some correlations of the presence of a pored epicortex with the main distribution pattern, morphology, chemistry and number of species. The pored epicortex, with a size of 15-40 lm in diameter and a density of 100 - 400 pores per mm^2, was defined by Hale as separate from the cortex. The associated acids, if present, are entirely cortical in origin.

In an earlier paper Hale (1976) could show some structures of thalli of *Coccocarpia ssp.*, which resemble the pored epicortex. These structures were found in further species of *Coccocarpia* (Arvidsson 1983) and in *Degelia* (Arvidson 1981).

The aim of the present paper is to show the distribution of the pored epicortex within the Coccocarpiaceae and Pannariaceae.

Material and Methods

Material. List of specimens photographed: *Coccocarpia erythroxyli* (Sprengel) Swinscow & Krog: USA, Louisiana, East Feliciana par., Idlewild experimental station 3.5 mi. SE of Clinton, 15.5.1979, S. Tucker 18410 (hb. Lumbsch); *Degelia gayana* (Montagne) Arvidson & Galloway: New Zealand, North Island, Coromandel Peninsula, Kanaeranga Valley, B.W. Hayward 552 (hb. Hayward); *Degelia plumbea* (Lightf.) P.M. Jörg. & P. James: France, Brittany, Finistere, Foret du Cranou, 7.4.1980. A. Henssen 21022 c (hb. Lumbsch); *Leioderma sorediatum* P.M. Jörg. & Galloway: Australia, NSW, Milo road, Monga State Forest, 19 km SE of Braidwood, 35 37′S, 149 54′E, 710 m, 10.9.1987, H. Streimann & H.T. Lumbsch 5653 a (hb. Lumbsch); *Pannaria fulvescens* (Montagne) Nyl.: Marshall Island, Majuro Atoll, Laura end of the island, 2 m, 17.1.1987, C.W. Smith 8515 (hb. Lumbsch); *Pannaria mariana* (Fr.) Müll. Arg.: USA, Hawaii, Puna Distr., SE coast of Hilo, 16.4.1983, W.A. Weber & A. Bujakiewicz (hb. Lumbsch); *Pannaria pezizoides* (Weber) Trev.: Germany, Bavaria, Oberallgäu, Gatterschwangalpe, 1600 m, near Rohrmoos, 9.7.1986, H.T. Lumbsch 4400 a (hb. Lumbsch); *Psoroma hirsutulum* Nyl.: Australia, Victoria, Hanging rock, 13.9.1987, R.B. Filson & H.T. Lumbsch 5661 a (hb. Lumbsch).

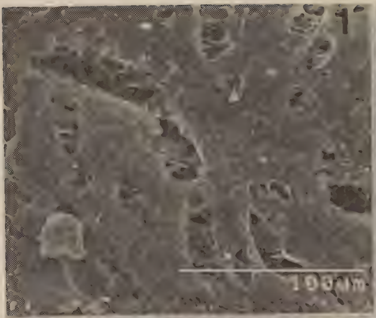
Methods. Lichen thalli were either used air dried or fixed within 37% formalin/100% acetic acid/70% ethanol (0.5:0.5:9e) for about 6 h and then washed in three changes of tap water. Thereafter they were dehydrated according to Samson et al. (1979). Critical point or air dried specimens were mounted on stubs and sputter-coated with gold. The specimens were examined in a Hitachi S-520 SEM.

Results and Dicussion

The thallus surface of the *Coccocarpia* species investigated was quite uniform. All specimens showed characteristic oblong pores (Fig. 1). These results confirm those made earlier by Arvidson (1983). The pores develop from small crevices. The number of pores was remarkable high compared with those of *Parmelia ssp.* studied (Lumbsch et al. 1988), although no counting was made. In *Degelia ssp. s.str.* we also found, as Arvidson (1981), a pored epicortex similar to this in *Coccocarpia* (Fig. 2). We also studied *Degelia plumbea*, which was recently included in *Degelia* and separated from *Parmeliella* (Jörgensen & James 1990), although some differences occur in the cortex anatomy. The *D. plumbea* group is distributed in Western Europe and Macronesia, while *Degelia s.str.* is mainly Southern Hemispherian. The finding of a pored epicortex in *D. plumbea* (Fig. 7) may support the view of Jörgensen and James, since we could not find any pores on the thallus of *Parmeliella triptophylla*, the type species of *Parmeliella*. The *D. plumbea* group differs in a number of further characters from *Parmeliella s.str.* as already pointed out by Jörgensen (1978).

The other species studied did not show a clear pored epicortex. In *Leioderma sorediatum* (Fig. 3) the thallus surface is verrucose and small pores may be visible, however no pored epicortex as defined by Hale is formed.

The genus *Pannaria* seems to be slightly heterogenous in view of thallus surface. In *P. fulvescens* (Fig. 4) and *P. mariana* (Fig. 5) we could find some strange structures which remind of a pored epicortex, but no real pores were visible. At the moment we cannot interprete these structures. In other species, e.g. *Pannaria pezizoides* (Fig. 6), the upper surface of the thallus is verrucose and does not show any pores or porelike structures.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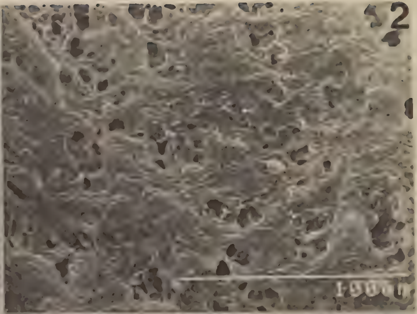
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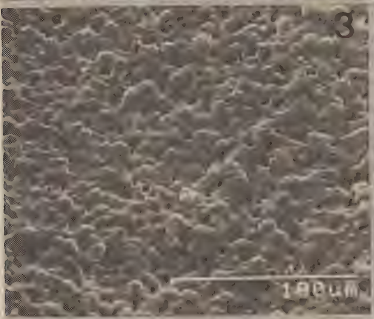
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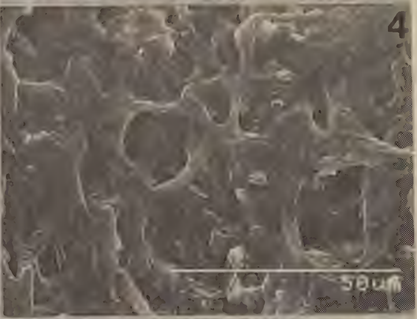
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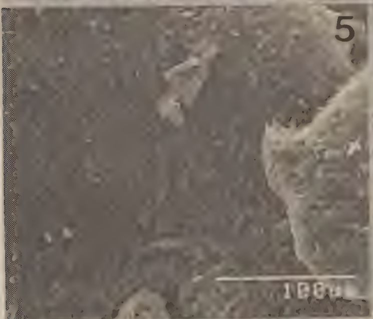
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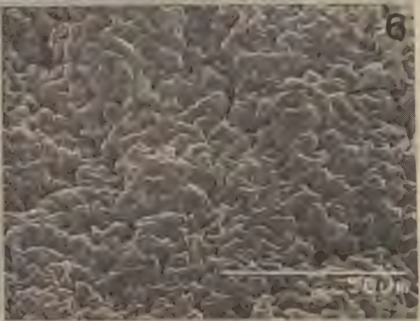
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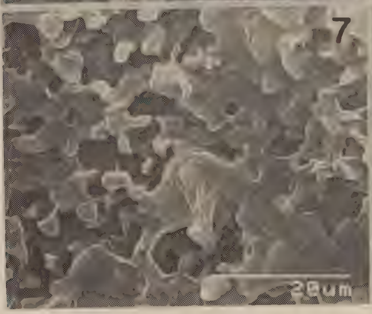
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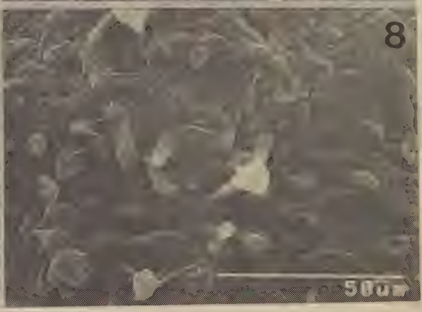
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Psoroma hirsutulum has a smooth upper surface with no definite pores, only small ridges are sometimes visible (Fig. 8).

Our results show that the Pannariaceae are heterogenous concerning their thallus surface. On the other hand there is a striking similarity between *Degelia* (Pannariaceae) and the type genus of the Coccocarpiaceae, *Coccocarpia*, which corresponds with morphological and anatomical data. Already Nylander (1857) was aware of the morphological and anatomical similarity of the *Coccocarpia* and the *D. plumbea* group, when he transfered *P. plumbea* to *Coccocarpia*. Arvidson & Galloway (1981), when describing *Degelia*, also pointed out the similarity of the two genera, as did Arvidson (1983). However, this similarity was interpreted as a result of convergent evolution, since some differences in ascomata ontogeny occur as Henssen and co-workers showed (Henssen 1963, 1969; Keuck 1977; Henssen & James 1980; Henssen et al. 1981). Further anatomical and ontogenetical studies, especially concerning the variability of the characters used when more specimens and species are examined, will surely enlighten this fascinating problem.

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Figs. 1-8: Surface of Coccocarpiaceae and Pannariaceae (SEM). 1. *Coccocarpia erythroxyli*; 2. *Degelia gayana*; 3. *Leioderma sorediatum*; 4. *Pannaria fulvescens*; 5. *Pannaria mariana*; 6. *Pannaria pezizoides*; 7. *Degelia plumbea*; 8. *Psoroma hirsutulum*.

LITERATURE CITED

Arvidson, L. (1981) Scanning electron microscopy of *Degelia* species. *Lichenologist* **13**: 199-200.

Arvidson, L. (1983) A monograph of the lichen genus *Coccocarpia*. *Opera Bot.* **67**: 1-96.

Arvidson, L. & D.J. Galloway (1981) *Degelia*, a new lichen genus in the Pannariaceae. *Lichenologist* **13**: 27-50.

Hale, M.E. (1976) Lichen structure viewed with the scanning-electron microscope. *In:* Brown, D.H., D.L. Hawksworth & R.H. Bailey (eds.): Lichenology: Progress and Problems. p. 1-15. London.

Hale. M.E. (1981) Pseudocyphellae and pored epicortex in the Parmeliaceae: their delimitation and evolutionary significance. *Lichenologist* **13**: 1-10.

Henssen, A. (1963) Eine Revision der Flechtenfamilien Lichinaceae und Ephebanaceae. *Symb. Bot. Upsal.* **18**: 1-123.

Henssen, A. (1969) Die Entstehung des Thallusrandes bei Pannariaceen (Lichenes). *Ber. Dtsch. Bot. Ges.* **82**: 235-248.

Henssen, A. & P.W. James (1980) *Parmeliella duplomarginata*, a new lichen from New Zealand. *Mycotaxon* **11**: 217-229.

Hennsen, A., G. Keuck, B. Renner & G. Vobis (1976) The Lecanoralean Centrum. *In:* D.R. Reynolds (ed.): Ascomycete systematics. The Lutrellian concept. p. 138-234. New York, Heidelberg, Berlin.

Jörgensen, P.M. (1978) The lichen family Pannariaceae in Europe. *Opera Bot.* **45**: 1-123.

Jörgensen, P.M. & P.W. James (1990) Studies in the lichen family Pannariaceae IV: The genus *Degelia*. *Bibl. Lichenol.* **38**: 253-276.

Keuck, G. (1977) Ontogenetisch-systematische Studie über *Erioderma* im Vergleich mit anderen cyanophilen Flechtengattungen. *Bibl. Lichenol.* **6**: 1-175.

Lumbsch. H.T., H.W. Kothe & J.A. Elix (1988) Resurrection of the lichen genus *Pleurosticta* (Parmeliaceae). *Mycotaxon* **33**: 447-455.

Nylander, W. (1857) Enumeration générale des lichens, avec l'indication sommaire de leur distribution géographique. *Mem. Soc. Imp. Sci. Naturelle Cherbourg* **5**: 85-146.

Sampson, R.A., J.A. Stalpers & W. Verkerke (1979) A simplified technique to prepare fungal specimens for scanning electron microscopy. *Cytobios* **24**: 7-11.

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NEW RECORDS OF HYPOTRACHYNA AND PARMELINOPSIS LICHENS (ASCOMYCOTINA, PARMELIACEAE) FROM NORTH-WEST AND CENTRAL ARGENTINA

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ABSTRACT: New records are reported for six species of *Hypotrachyna* (Vainio) Hale and three species of *Parmelinopsis* Elix & Hale and brief descriptions of these species are given. *Hypotrachyna leiophylla* (Kurok.) Hale is reported from Argentina, the first record of this species outside of Africa. *Parmelinopsis afrorevoluta* (Krog & Swinscow) Elix & Hale is new to South America and *Hypotrachyna endochlora* (Leighton) Hale, *H. revoluta* (Flörke) Hale and *Parmelinopsis minarum* (Vainio) Elix & Hale are new to Argentina. New provincial records are reported for a further four species.

Introduction

In a continuation of our recent studies on the lichen family Parmeliaceae in Argentina (Adler, 1987, Elix & Adler, 1987, Adler & Elix, 1987, Adler, 1989), we report new records and data for nine species in the genera *Hypotrachyna* and *Parmelinopsis.*

Throughout this work the chemical constituents were identified by thin layer chromatography (Culberson, 1972, Culberson & Ammann, 1979, Culberson, C., Culberson, W. & Johnson, 1981), high performance liquid chromatography (Lumbsch & Elix, 1985) and comparison with authentic samples.

Unless otherwise stated, specimen numbers (in brackets) refer to the BAFC herbarium identification.

HYPOTRACHYNA (Vainio) Hale
Phytologia **28** (4): 340-342 (1974)

1. *Hypotrachyna endochlora* (Leighton) Hale
Smiths. Contr. Bot. **25**: 34 (1975)

Thallus corticolous or saxicolous, pale grey, adnate, to 10 cm diam.; lobes sublinear, 1-5 mm wide, subdichotomous to dichotomously branched. Upper surface pustulate, the pustules ± sorediate, terminal or subterminal; the soredia coarsely granular, diffuse or in capitate soralia. Medulla white to very pale greenish-yellow. Lower surface black, rhizines furcate to highly dichotomously branched; marginal rhizines evident at lobe axils. Apothecia not seen; conidia bifusiform 4-6 μm long.

Chemistry. Cortex K+ yellow, medulla K+ yellow-orange, C+ pale yellow, KC+ yellow-orange. Atranorin, chloroatranorin, obtusatic acid (major), secalonic acid A (major pigment), barbatic acid (minor), diffractaic acid (trace).

Specimens examined: Jujuy prov., Departamento Capital, Lagunas de Yala, 2200 m, M.T. Adler, ii/86, on rock (36.712, 36.715), on bark (36.711).

New to Argentina.

2. ***Hypotrachyna immaculata*** (Kurok.) Hale
Smiths. Contr. Bot. **25**: 41 (1975)

Thallus corticolous or saxicolous, pale grey, adnate, to 5 cm diam.; lobes sublinear, 1-3 mm wide, subdichotomously to dichotomously branched. Upper surface with pustular dactyls; the pustules laminal, frequently terminal or subterminal, eroding into open pores or becoming coarsely sorediate. Medulla white. Lower surface black, rhizines dichotomously divided or furcate. Apothecia and pycnidia not seen.

Chemistry. Cortex K+ yellow, medulla K+ purple-orange, C+ pale yellow, KC+ purple. Atranorin, chloroatranorin, colensoic acid, 4-*O*-methylphysodic acid, lividic acid, physodic acid, oxyphysodic acid [the colensoic-lividic acid complex] and skyrin (K+ purple pigment).

Specimens examined: **AFRICA**. KENYA, Rift Valley prov., O. Almborn, V/49 (LD, 11481); REPUBLIC OF SOUTH AFRICA, Orange Free State, Kofler (LD, 310.205); Transvaal, O. Almborn (LD, Holotype: 6551; other collections: LD, 6247, 6440). **SOUTH AMERICA**, ARGENTINA, Cordoba prov., Departamento Punilla, near Tanti, on route 20, N.C. Scutari & M.T. Adler, x/85, on rock (35.519); Santiago del Estero prov., Departamento El Copo, Reserva de El Copo, J. Protomastro & M.T. Adler, vi/85, on bark (36.516, 36.517, 36.518, 36.716), ibid. x/85 (36.515).

These are the first records of this species for Cordoba and Santiago del Estero provinces although it was previously recorded from Corrientes province (Ferraro, 1981).

The few Argentine specimens studied were significantly smaller than the African ones, but were otherwise morphologically comparable. True primary soralia (not formed from pustules) were not observed in specimens from Argentina so the intergradation between primary soralia and pustules observed in the African specimens (Krog & Swinscow, 1979) has yet to be confirmed here.

3. ***Hypotrachyna leiophylla*** (Kurok.) Hale
Phytologia **28** (4): 341 (1974)

Thallus corticolous or saxicolous, loosely adnate, pale grey, to 10 cm diam.; lobes sublinear, 1-4 mm wide, subdichotomously branched, with truncate to subacute apices. Upper surface dactylate, dactyls dense, crescent shaped, vertical, branched, erumpent but becoming coarsely granular rather than sorediate. Medulla white except at the dactyls where it becomes yellow to orange pigmented. Lower surface black, rhizines furcate or dichotomously divided. Apothecia and pycnidia not seen.

Chemistry. Cortex K+ yellow, medulla K+ purple at the dactyls or K- on the lobes, C+ red, KC+ red-orange. Atranorin, chloroatranorin, 4-*O*-demethylmicrophyllinic acid (major), olivetoric acid (major) and skyrin (K+ purple pigment, minor).

Specimens examined: **AFRICA**. REPUBLIC OF SOUTH AFRICA, Natal, O. Almborn x/53 (LD, 8074), xi/53 (LD, 9191), O. Almborn (LD, 9969); Transvaal, O. Almborn, x/53 (LD, 6796: holotype). **SOUTH AMERICA**, ARGENTINA, Jujuy prov., Departamento Capital, Lagunas de Yala, 2200 m., M.T. Adler, ii/86, on rock (36.709, 36.710).

This is the first reported occurrence of this species outside of Africa. The dactyls in the Argentine specimens were somewhat taller than in the African ones, but the remaining morphological and chemical characters were comparable in both groups of collections. The variations observed in the dactyl morphology of the Argentine specimens, closely parallel that described by Krog & Swinscow (1979).

4-*O*-Demethylmicrophyllinic acid is responsible for the pale spot on TLC plates (similar to alectoronic acid) mentioned by Krog and Swinscow (1979) in their description of the chemistry of this species, as noted by Brusse (1991).

4. ***Hypotrachyna livida*** (Taylor) Hale
Smiths. Contr. Bot. **25**: 45 (1975)

Thallus corticolous or saxicolous, more or less coriaceous, loosely adnate, pale grey, up to 9 cm diam.; lobes sublinear, 1-4 mm wide, subdichotomously divided, with truncate to subacute apices. Upper surface shiny, lacking soredia, isidia and dactyls. Medulla white. Lower surface black, moderately to densely rhizinate, rhizines furcate or sparingly dichotomously divided. Apothecia numerous, adnate to substipitate, 1-5 mm diam.; ascospores 5-8 × 8-10 μm. Pycnidia with bifusiform conidia, 4-7 μm long.

Chemistry. Cortex K+ yellow, medulla K- or K+ pink-pale purple, C-, KC+ purple-violet. Atranorin, chloroatranorin, colensoic acid (major), methoxycolensoic acid (trace), 4-*O*-methylphysodic acid (major), hydroxycolensoic acid (trace) and lividic acid (minor) or atranorin, chloroatranorin, colensoic acid (minor), 4-*O*-methylphysodic acid (major), lividic acid (major), physodic acid (trace), oxyphysodic acid (trace).

Specimens examined: Cordoba prov., Departamento Punilla, near Tanti, on route 20, N.C. Scutari & M.T. Adler, (36.513); 3 km from El Durazno, on rock (36.530). Jujuy prov., Departamento Capital, on bank of Yala River shore, 1500 m, on *Alnus jorulensis*, M.T. Adler, ii/86 (36.704, 36.705, 36.706).

New to Cordoba and Jujuy provinces.

Given the chemical and morphological variation observed for these specimens it is possible that more than one taxon is involved. The morphological variation of *H. livida* has been noted previously by Hale (1975), but there appeared to be no consistent correlation between morphology and chemistry when specimens from a broad geographical range (i.e. North and South America) were examined.

5. ***Hypotrachyna pluriformis*** (Nyl.) Hale
Smiths. Contr. Bot. **25**: 55 (1975)

Thallus saxicolous, adnate to loosely adnate, pale grey, to 5 cm diam.; lobes sublinear to subirregular, 0.5-2 mm wide, with truncate to subacute apices. Upper surface with cortex easily breaking and flaking off, lacking soredia, isidia and dactyls. Medulla white. Lower surface black, moderately rhizinate, rhizines predominantly dichotomous but frequently furcate and simple in younger parts. Apothecia common, substipitate, 2-10 mm diam.; ascospores 7-10 × 11-14 µm. Conidia bifusiform, 5-6 µm long.

Chemistry. Cortex K+ yellow, medulla K-, C+ pink to red, KC+ red. Atranorin, chloroatranorin, gyrophoric acid (major), and 5-*O*-methylhiascic acid (minor).

Specimens examined: Cordoba prov., Departamento Punilla, near Tanti, N.C. Scutari & M.T. Adler, x/85, on rock (36.527, 36.528); M.T. Adler, x/85, 3 km from El Durazno, on route 20, on rock (36.527, 36.528); M.T. Adler, Los Gigantes, on rock (36.526); near Copina, N.C. Scutari & M.T. Adler, on rock (36.529).

New to Cordoba province. This species was formerly known from Misiones Province (Hale 1975; Osorio 1981).

6. ***Hypotrachyna revoluta*** (Flörke) Hale
Smiths. Contr. Bot. **25**: 60 (1975)

Thallus saxicolous, loosely adnate, grey, up to 4 cm diam.; lobes linear elongate, apically truncate to subacute, 1-5 mm wide pustulate or sorediate lobes frequently becoming revolute. Upper surface pustulate, the pustules becoming sorediate with granular soredia or directly flaking off the upper cortex. Medulla white. Lower surface black, rhizines sparingly (1-3 times) dichotomously divided. Apothecia and pycnidia not seen.

Chemistry. Cortex K+ yellow, medulla K-, C+ pink to red, KC+ red to orange. Atranorin, chloroatranorin, gyrophoric acid (major), and 5-*O*-methylhiascic acid (minor), 4,5-di-*O*-methylhiascic acid (trace), umbilicaric acid (trace).

Specimens examined: Jujuy prov., Departamento Capital, Lagunas de Yala, 2200 m, M.T. Adler, ii/86, on rock (36.707, 36.708).

New to Argentina.

PARMELINOPSIS Elix & Hale
Mycotaxon **29**: 233-244 (1987).

1. ***Parmelinopsis afrorevoluta*** (Krog & Swinscow) Elix & Hale
Mycotaxon **29**: 242 (1987).

Thallus saxicolous, loosely adnate, pale grey, up to 8 cm diam.; lobes 1-3 mm wide, subdichotomously divided, with truncate to subacute apices; marginal cilia (rhizines) abundant, evident in almost every part of the lobe margin. Upper surface pustulate, pustules cerebriform, terminal or subterminal, becoming sorediate with granular soredia sometimes forming capitiform soralia, ultimately forming pores by rupture of the dactyls. Upper cortex fragile, sometimes flaking off. Medulla white, darkening on exposure. Lower surface black, rhizines predominantly simple, more rarely furcate. Apothecia and pycnidia not seen.

Chemistry. Cortex K+ yellow, medulla K-, C+ pink to red, KC+ red. Atranorin, chloroatranorin, gyrophoric acid (major), and 5-*O*-methylhiascic acid (minor), 4,5-di-*O*-methylhiascic acid (minor), 2,4,5-tri-*O*-methylhiascic acid (trace) and umbilicaric acid (trace).

Specimens examined: Jujuy prov., Departamento Capital, Lagunas de Yala, 2200 m, M.T. Adler, ii/86, on rock (36.702, 36.704).

New to South America.

2. ***Parmelinopsis bonariensis*** Adler & Elix
Mycotaxon **30**: 341 (1987).

Thallus loosely adnate to bark, pale grey, up to 3 cm diam.; lobes 1-2 mm wide, apically truncate, marginal cilia (rhizines) conspicuous in the lobe axils. Upper surface shiny, isidia, soredia and pustules absent. Medulla white. Lower surface black to tan, rhizines predominantly simple or furcate. Apothecia substipitate; ascospores, 5-8 × 9.5-13 μm; conidia bifusiform, 6-6.5 μm long.

Chemistry. Cortex K+ yellow, medulla K-, C-, KC+ wine-pink turning reddish-orange. Atranorin, chloroatranorin, 3-methoxy-2,4-di-*O*-methylgyrophoric acid (major), gyrophoric acid (major), umbilicaric acid (minor), hiascic acid (trace) and 3-methoxy-umbilicaric acid (major), 3-hydroxyumbilicaric acid (trace) (Elix, Yu & Adler, 1989).

Specimen examined: Santiago del Estero prov., Departamento El Copo, Reserva de El Copo, J. Protomastro & M.T. Adler, ii/85, on bark (36.521).

This is the first report of this endemic Argentine species outside of Buenos Aires Province where it is generally saxicolous.

3. ***Parmelinopsis minarum*** (Vainio) Elix & Hale
Mycotaxon **29**: 243 (1987).

Thallus corticolous or saxicolous, adnate, pale grey, up to 5 cm diam.; lobes 0.5-3 mm wide, with marginal cilia (rhizines) conspicuous in the lobe axils. Upper surface densely isidiate, isidia eciliate, simple and cylindrical at first but becoming branched at maturity, apically olive coloured. Medulla white. Lower surface black, rhizines long, simple to furcate. Apothecia and pycnidia not seen.

Chemistry. Cortex K+ yellow, medulla K+ light pink, C+ pink, KC+ red. Atranorin, chloroatranorin, gyrophoric acid (major), 5-*O*-methylhiascic acid (minor), 4,5-di-*O*-methylhiascic acid (trace) and umbilicaric acid (trace).

Specimens examined: Jujuy prov., Departamento Capital, on bank of Yala River, 1500 m, M.T. Adler, ii/86, on *Alnus jorulensis* (36.700, 36.701), near Lagunas de Yala, on *A. jorulensis* (36.690), on rock (36.687, 36.688, 36.689).

Parmelinopsis minarum (Vainio) Elix & Hale has not been recorded previously for Argentina. Osorio (1981) recorded *Parmelina dissecta* (Nyl.) Hale from Misiones Province, a species with which *Parmelia minarum* Vainio was synonymized by Hale

(1976). *Parmelia dissecta* Nyl. is in fact a synonym of *Parmelia horrescens* Taylor (*fide* Krog & Swinscow, 1979), with both species containing substantial amounts of 3-methoxy-2,4-di-*O*-methylgyrophoric acid (formerly known as the horrescens unknown) and having ciliate isidia. *P. minarum* has simple isidia and either lacks or contains only traces of 3-methoxy-2,4-di-*O*-methylgyrophoric acid. So, *Parmelinopsis minarum* (Vainio) Elix & Hale and *Parmelinopsis horrescens* (Taylor) Elix & Hale (= *Parmelina dissecta*) are distinctly different species.

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LITERATURE CITED

Adler, M.T. (1987). A New Species of the Genus *Canoparmelia* from Argentina. *Mycotaxon* **28**: 251-254.

Adler, M.T. (1989). Two New Species in Parmeliaceae (Lichenized Ascomycotina) and New Records for Argentina. *Mycotaxon* **35**: 399-404.

Adler, M.T. & J.A. Elix (1987). Three New Saxicolous Species in Parmeliaceae (Lichenized Ascomycotina) from Argentina. *Mycotaxon* **30**: 339-344.

Brusse, F.A. (1991). Eight New Species in the Lichen Genus *Parmelia*. *Mycotaxon* **40**: 377-393.

Culberson, C.F. (1972). Improved Conditions and New Data for the Identification of Lichen Products by Standardized Thin Layer Chromatographic Method. *J. Chromatogr.* **72**: 113-125.

Culberson, C.F. & K. Ammann (1979). Standardmethode zur Dunnschichtchromatographie von Flechtensubstanzen. *Herzogia* **5**: 1-24.

Culberson, C.F., W.L. Culberson & A. Johnson (1981). A Standardized TLC Analysis of β-Orcinol Depsidones. *The Bryologist* **84**: 16-29.

Hale, M.E. (1975). A Revision of the Lichen Genus *Hypotrachyna* (Parmeliaceae) in Tropical America. *Smiths. Contr. Bot.* **25**: 1-73.

Hale, M.E. (1976). A Monograph of the Lichen Genus *Parmelina* Hale. *Smiths. Contr. Bot.* **33**: 1-60.

Elix, J.A. & M.T. Adler (1987). A New Species of *Flavoparmelia* and *Flavopunctelia* (Lichenized Ascomycotina) from Argentina. *Mycotaxon* **30**: 335-338.

Elix, J.A., Yu Jin & M.T. Adler (1989). 3-Hydroxyumbilicaric Acid and 3-Methoxyumbilicaric Acid, New Tridepsides from the Lichen *Parmelinopsis bonariensis*. *Austr. J. Chem.* **42**: 765-770.

Ferraro, L.I. (1981). Contribucion al estudio de las Parmeliaceas (liquenes) de Corrientes, Rep. Argentina. *Bonplandia* **V** (12): 83-99.

Krog, H. & T.D.V. Swinscow (1979). *Parmelia* Subgenus *Hypotrachyna* in East Africa. *Norw. Journ. Bot.* **26**: 11-43.

Lumbsch, H.T. & J.A. Elix (1985). A New Species of the Lichen Genus *Diploschistes* from Australia. *Pl. Syst. Evol.* **150**: 275-279.

Osorio, H. (1981). Contributions to the Lichen Flora of Argentina XIII. Lichens of Misiones Province. *Com. Bot. Mus. Hist. Nat. Montevideo* **4** (63): 1-18.

MYCOTAXON

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GLOMUS LAMELLOSUM sp. nov.: A NEW GLOMACEAE ASSOCIATED WITH BEACH GRASS

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Analysis of soil and roots sampled from the Great Lakes region revealed the presence of an undescribed *Glomus* species associated with American beach grass (*Ammophila breviligulata* Fern.). Spores were abundant in roots and sandy soils of the eastern shore of Nottawasaga Bay, Georgian Bay, Ontario and also were found in a soil sample from the western shore of Lake Michigan. Isolated spores were successfully propagated on *Allium porrum* L. plants.

The description reported here is based on fresh specimens mounted in a polyvinyl alcohol-lactic acid-glycerol (PVLG) medium (Omar et al., 1979) and observed with differential interference contrast (DIC) and ultra-violet autofluorescence optics. Roots were observed after Trypan Blue staining (Koske & Gemma, 1989). Spore wall description follows the murograph terminology of Walker (1983, 1987). Holotypes have been deposited at the National Mycological Herbarium, Agriculture Canada, Ottawa (DAOM), and isotypes were deposited at Oregon State University Herbarium (OSC) and Farlow Herbarium (FH).

GLOMUS LAMELLOSUM Dalpé, Koske & Tews sp. nov. Figs. 1-10

Sporocarpia ignota. Sporae singulares, hyalinae, citrinae ad flavidae, globosae ad irregulares (98-)106-142 x 122-162 μm. Tunica sporae in stratorum trium turma una, exteriore lamellosa pagina, hyalina ad citrina, laminata (2-) 6-12,5 (-16) μm crassa ; media citrina ad flavida, laminata, 6-12,5 μm crassa ; interiore hyalina, membranacea <1 μm crassa. Hyphae sustinentes hyalinae ad citrinae, rectae vel recurvae, cylindricae vel subinfundibuliformes, 8-13 μm crassae ; tunicae 1,5-2 μm crassae. Porus apertus 1-1,5μm latus. Mycorrhizae cum vesiculis et arbusculis formans.

Sporocarps unknown. Spores formed singly in soil or in roots, hyaline when young, lemon-yellow to light yellow at maturity (#86 ISCC-

NBS Color-Name Charts), globose to irregular, (98-)106-142 x 122-162 µm (Figs 1,2,8). Spore wall structure (Figs 2,4,8) of three walls (1-3) in one group (A). Wall 1 a flaking but persistent hyaline to lemon-yellow laminated wall, (2-) 6-12.5 (-16) µm thick, with a foliated, lamellate surface that sloughs away with age (Figs 3,6,8,9). Wall 2 lemon to light yellow, laminated, 6-12.5 µm thick, abruptly terminated at lumen level (Figs 1,6). Wall 3 hyaline, membranous, <1 µm thick, adherent to wall 2, sometimes difficult to distinguish. Subtending hyphae hyaline to lemon-yellow, straight to recurved, cylindrical to slightly funnel shaped, 8-13 µm in diameter at spore base (Figs 1,6). Wall of subtending hyphae hyaline to pale yellow, 1.5-2 µm thick, continuous with spore wall 1 and 2. Pore usually open, sometimes closed by a curved septum, 1-1.5 µm wide, inflated to 6-8 µm below the septum. Extramatrical hyphae hyaline, often septate, 8-10 µm wide with walls 2 µm thick.

ETYMOLOGY

Latin - lamellosus = lamellate, arranged in layers or thin plates, referring to the outer surface of spore wall 1.

DISTRIBUTION AND HABITAT

Known from sandy habitats from Great Lakes area: sandy shore of Nottawasaga Bay in Georgian Bay, Ontario, Canada; sand dunes of Bailey's Harbor, Wisconsin, U.S.A. as *Glomus* species A described in Koske & Tews, 1987.

MYCORRHIZAL ASSOCIATIONS

In the field, the species was associated with *Ammophila breviligulata* Fern and *Avena* sp. It formed typical vesicular-arbuscular mycorrhizae when pot-cultivated with *Allium porrum* L. (Fig. 3).

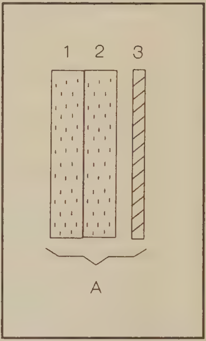
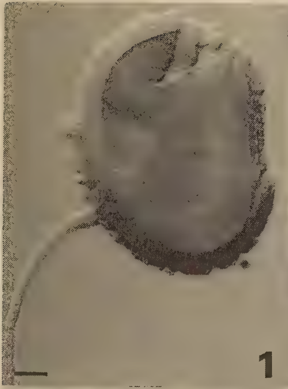


Fig. 10. Murograph.

COLLECTIONS EXAMINED:

TYPE: Canada, Beach # 1, Wasaga Beach Provincial Park, Simcoe Co., in the rhizosphere of *Ammophila breviligulata* Fern., 31/08/89 (Dalpé & Mitrow # 3938) DAOM 212349.

Figs. 1-9. *Glomus lamellosum*. Fig. 1. Spore with subtending hypha. 2,4. Crushed spore. Fig. 3. Surface of spore wall 1. Fig. 5. Spore with hyphae (Autofluorescence under U.V. light). Fig. 6. Spore wall at pore level. Fig. 7. Intraradical vesicle and arbuscules (Trypan Blue staining). Fig. 8. Spore with subtending hyphae. Fig. 9. Cross-section of spore wall at pore level. Figs 1-4,6,7. Differential Interference Contrast. Figs 8,9. Scanning Electron Microscope. Bar lines = 30 µm.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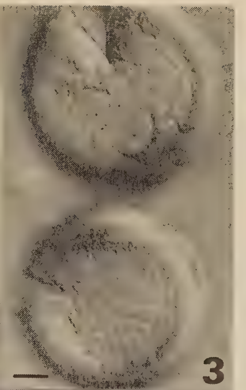
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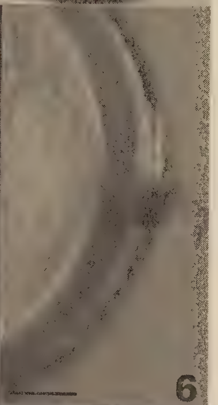
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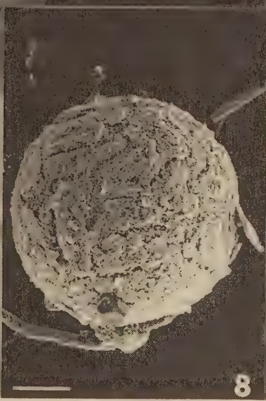
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ISOTYPE: Canada, pot-culture on *Allium porrum*. Ottawa Ont., 10/10/90 DAOM 212349 (Isotypes, FH, OSC).
OTHER COLLECTION: U.S.A., Kohler-Andre State Park, Sheboygan Co., Wisconsin, in the rhizosphere of *Ammophila breviligulata*. 83/10 (Tews #KA-4-1).

DISCUSSION

Spores of *Glomus lamellosum* are easily detected in soil sievings under the dissecting microscope by their lemon-yellow to light yellow coloration and their rough surface in reflected light. With the compound microscope, spores are readily distinguished by the flaking outer surface of wall 1 and the relatively thick, lemon yellow laminate wall 2. When the spore surface is examined in U.V. light, it autofluoresces strongly, revealing the plate-like nature of the flaking surface (Fig. 5).

The outermost wall of spores of *G. lamellosum* is reminiscent of the thick, hyaline wall 2 of spores of *G. clarum* Nicol. & Schenck. Laminations are not readily apparent, and the wall has a glistening quality to it, suggesting that its composition is different from that of the more typical type of laminated wall (e.g., wall 2 of *G. lamellosum*). Reactions to Cotton blue and Congo Red are not distinctive. With lactic acid, wall 1 loses its foliated appearance and the surface becomes distorted and crusty. Melzer's reagent treatment increases contrast of wall 2 laminations and facilitates the distinction between walls 1 and 2.

In most specimens, the innermost wall does no readily separate from wall two and is not easily observed (Figs. 1,4). In some well-crushed specimens, however, wall 3 is displaced from wall 2 and is clearly defined (Figs 2,6).

The subtending hypha has two apparent walls, an outer, flaking one derived from wall 1 of the spore and an inner one that is continuous with wall 2. As wall 2 merges into the inner wall of the subtending hypha, the color is lost, and the entire subtending hypha is hyaline to very pale yellow.

Spores of *G.lamellosum* are most likely to be confused with those of *G. fasciculatum* (Thaxter) Gerd. & Trappe sensu Thaxter (Walker & Koske, 1987). Spores of both species are similar in size and color, have relatively thick laminated walls (in comparison to spore diameter) and innermost membranous walls, and the walls of the subtending hyphae taper markedly away from the spore. Spores of *G. fasciculatum*, however, have a thin outermost hyaline unit wall that does not flake or slough with age.

Spores of *G. halonatum* Rose & Trappe also possess a thick, hyaline outermost wall that roughens with age. Unlike spores of *G. lamellosum*, those of *G. halonatum* are light brown to brown in color, range in diameter from 200-280 μm, with a thick, laminated inner wall ornamented with short, crowded spines that project into the hyaline wall.

After 12 to 15 weeks of pot-cultivation, the species produces abundant extraradical spores, and the roots were typically colonized with arbuscules and vesicles (Fig. 7). No intraradical spores were observed in pot-cultivated leek plants (*Allium porrum* L.). In the field, however, intra- and extraradical spores were associated with roots of *Ammophila breviligulata*.

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LITERATURE CITED

ISCC-NBS Color-Name Charts Illustrated with Centroid Colors. 1964. Supplement to National Bureau of Standards (NBS) Circular 553

Koske, R.E. and Gemma, J.N. 1989. A modified procedure for staining roots to detect VA mycorrhizas. Mycol. Res. 92: 486-488.

Koske, R.E. and Halvorson, W.L. 1989. *Scutellospora arenicola* and *Glomus trimurales*: two new species in the Endogonaceae. Mycologia 81: 927-933.

Koske, R.E. and Tews, L.L. 1987. Vesicular-arbuscular mycorrhizal fungi of Wisconsin sandy soils. Mycologia 79: 901-905.

Koske, R.E., Friese, C., Walker, C. and Dalpé, Y. 1986. *Glomus pustulatum*: A new species in the Endogonaceae. Mycotaxon 26: 143-149.

Omar, M.B., Bolland, L. and Heather, W.A. 1979. A permanent mounting medium for fungi. Bull. Br. Myc. Soc. 13: 31-32.

Walker, C. 1983. Taxonomic concepts in the Endogonaceae: spore wall characteristics in species descriptions. Mycotaxon 18: 443-455.

Walker, C. and Koske, R.E. 1987. Taxonomic concepts in the Endogonaceae: IV. *Glomus fasciculatum* redescribed. Mycotaxon 30: 253-262.

MYCOTAXON

Volume XLIII, pp. 295-296 January-March 1992

THE USE OF THE BINOMIAL

DACTYLARIA PYRIFORMIS

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In a recent publication **Tzean & Chen (1991)** described a new species, *Dactylaria pyriformis*. This is a later homonym. The name *Dactylaria pyriformis* was validly published in 1954 (**Juniper, 1954**). The fungus was transferred to *Arthrobotrys*, together with all other nematode-trapping *Dactylaria* species, by **Schenk, Kendrick & Pramer (1977)**, but this transfer has not received universal recognition.

Dactylaria pyriformis Tzean & Chen is markedly different from *D. pyriformis* Juniper and its assignation to the genus *Dactylaria* is not obvious, as acknowledged by the authors.

Since the species is not known to be nematophagous, it is retained in *Dactylaria*, and a new name is required:

Dactylaria sporexamorpha S. L. Glockling, nom. nov.

Derivation: spores from a conidiophore of ill-defined morphology.

SYNONYM: *Dactylaria pyriformis* Tzean & Chen, *Mycological Research* **95**: 1002 (1991)
non *Dactylaria pyriformis* Juniper, *Transactions of the British Mycological Society* **37**: 437 (1954)

REFERENCES

JUNIPER, A. J. (1954) *Dactylaria pyriformis* sp. nov. *Transactions of the British Mycological Society* **37**: 437-440.

SCHENK, S., KENDRICK, W. B. & PRAMER, D. (1977) A new nematode-trapping hyphomycete and a revaluation of *Dactylaria* and *Arthrobotrys*. *Canadian Journal of Botany* **55**: 977-985.

TZEAN, S. S. & CHEN, J. L. (1991) Two new species of *Dactylaria* from Taiwan. *Mycological Research* **95**: 1000-1004.

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A RE-EVALUATION OF PHYTOPHTHORA SPECIES DESCRIBED BY K. SAWADA IN TAIWAN

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ABSTRACT

This paper reviews the taxonomic status of all 23 species of *Phytophthora* described by K. Sawada in Taiwan, based on a study of available dried plant specimens, type/authentic cultures and the original publications. Of the 16 new species erected by Sawada, *P. boehmeriae*, *P. citricola* and *P. lepironae* are good species while *P. leersiae* is considered distinct enough to be recognized and a Latin diagnosis has been provided to validate its publication. *Phytophthora cinchonae* is treated as synonymous with *P. cinnamomi*; *P. cyperi-iriae* and *P. cryperi-rotundati* with *P. cyperi*, whereas *P. allii*, *P. lycopersici*, *P. melongenae*, *P. murrayae*, *P. ricini*, *P. tabaci* and *P. taihokuensis* are all considered conspecific with *P. nicotianae* (*P. parasitica*). *Phytophthora polygoni* is judged to be insufficiently described to be evaluated. There is no record of *P. persica* in Sawada's publications or specimen collection. In addition, Sawada's findings of *P. cactorum* on ramie, *P. colocasiae* on taro and *P. infestans* on potato and tomato have been confirmed. Sawada's specimen of *P. infestans* on the leaves of *Tubocapsicum anomalum* is a new host record for the species.

INTRODUCTION

The study of the genus *Phytophthora* in Taiwan was initiated more than 80 years ago by Kaneyoshi Sawada who described a total of 23 species of *Phytophthora* attacking various plants, cultivated as well as wild. He published exclusively in Japanese in regional periodicals not available to foreign scientists and failed to provide English or Latin diagnosis of his 16 new species. In most cases, Sawada's findings have not been confirmed by other researchers and remained as the first and the only record. Waterhouse (1963) accepted *P. boehmeriae* Saw., *P. citricola* Saw. and *P. lepironae* Saw. as good species and rejected the other 13 new species based almost exclusively on original diagrams and translated, abridged diagnosis or on technicalities governing the validity and legitimacy of published epithets in accordance with the International Code of Botanical Nomenclature. In order to properly assess Sawada's contribution to the study of the genus *Phytophthora*, we decided to re-examine all available Sawada's specimens and cultures and to conduct a literature research on his original publications. Portions of

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[2] Work was done while at the Institute of Botany, Academia Sinica, Taipei, R.O.C. as Visiting Professor.

the results have been reported briefly in a recent review on Taiwan *Phytophthora* (Ho, 1990).

MATERIALS AND METHODS

Sawada's dried *Phytophthora* specimens were deposited at the herbarium of the Department of Plant Pathology, National Taiwan University, Taipei. Small pieces of diseased plant materials were cut out, cleared in 2% potassium hydroxide solution for 48 hr in a small vial with screw cap, rinsed with several changes of distilled water, stained and mounted in 0.05% cotton blue/lactophenol. The plant materials were carefully teased apart to reveal the fungal structures which were examined and photographed with an Olympus BH-2 light microscope using interference or phase contrast light microscopy.

Type or authentic cultures of *P. boehmeriae* , *P. citricola* , *P. melongenae* Saw. and *P. tabaci* Saw. were obtained from the American Type Culture Collection at Rockville, Maryland. They were grown on clarified V8 juice agar medium and studied morphologically as described by Ho and Jong (1986).

RESULTS

Phytophthora allii Saw., Spec. Bull. Exp. Sta. Gov. Formosa 11: 59-60. 1915. Fig.1

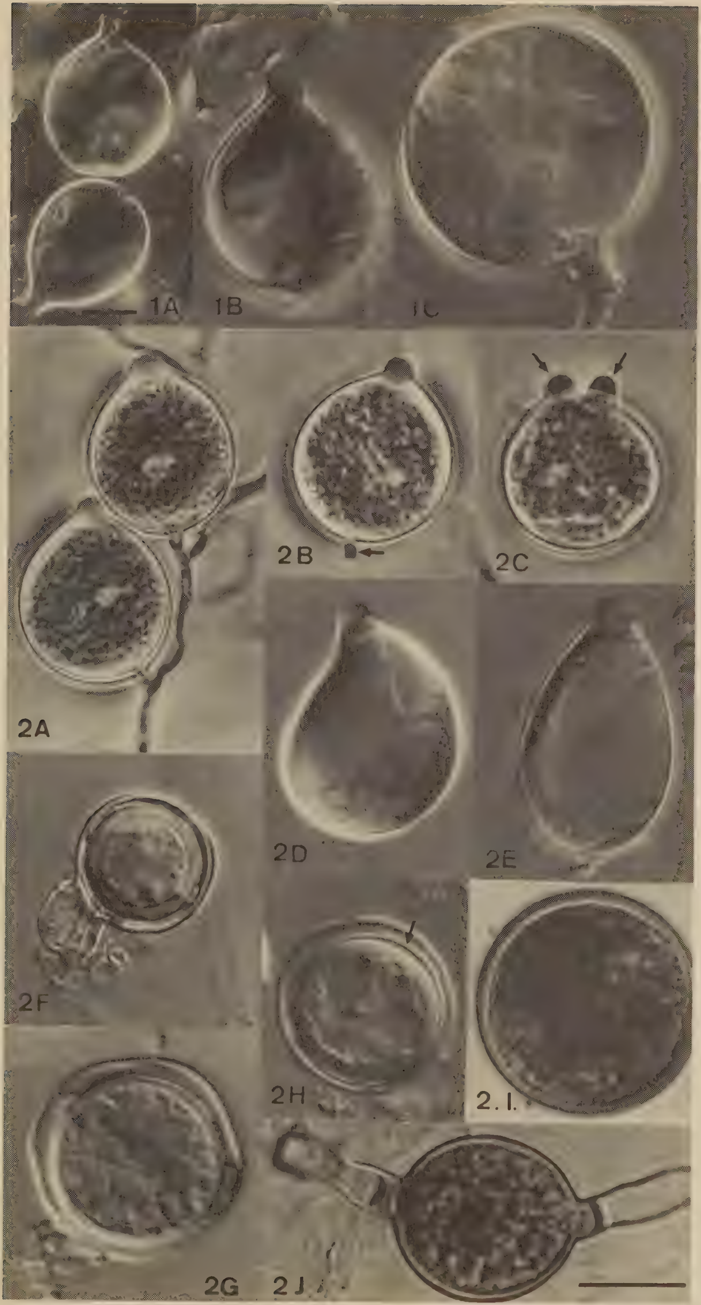
This species was described on the leaves of *Allium fistulosum* L. from Taipei (Sawada, 1914, 1915c, 1916a, 1919c). It was considered similar to *P. parasitica* Dast. in the characteristics of sporangia, chlamydospores and growth-temperature relationship, but differed primarily in having slightly smaller oogonia and oospores with thinner walls. Waterhouse (1963) suggested that it is "probably the same as *nicotianae* var. *nicotianae* ". The culture is no longer in existence. We found from the type specimen only irregular *Phytophthora* -like intercellular hyphae. Nevertheless, we discovered on the dried leaves of *Allium odorum* L. from Taipei, a fungus that Sawada labeled as *Phytophthora* sp. with sporangia and chlamydospores closely resembling *P. nicotianae* Breda de Haan (=*P. parasitica*) *sensu* Ho and Jong (1989) and it seems reasonable to treat *P. allii* as such. Ito (1936) also considered *P. allii* so similar to *P. parasitica* that it might be treated as a biotype of the latter. Novotel'Nova (1974) listed *Allium* spp. including *A. fistulosum* as one of the host for *P. nicotianae* var. *parasitica* .

SPECIMENS EXAMINED : TAIWAN: TAIPEI, on *Allium fistulosum* , 20, 26 Sept, 4 Oct 1928, 16 Aug 1929; on *A. odorum* , 16 Aug 1929.

Phytophthora boehmeriae Saw., Rept. Dept. Agr. Gov. Res. Inst. Formosa 27: 10-11. 1927. Fig.2

Fig.1. A-C. *Phytophthora* sp. on *Allium odorum* . A, B. Papillate sporangia to show basal plug (arrow) in A, and hemispherical apical thickening (arrow) in B. C. Chlamydospore.

Fig.2. A-J. *Phytophthora boehmeriae* on *Boehmeria nivea* . A. Sympodially branched sporangiophore with papillate sporangia. B-E. Deciduous sporangia to show short pedicel (arrow) in B, and two protruding apices with hemispherical thickening (arrow) in C. F, G. Oogonium with amphigynous antheridium. H. Oospore enclosed by a thin envelop (arrow). I, J. Chlamydospores (A-C, F, I, J, from type culture; D, E, G, H from type specimen). Scale bar = 20µm. All at same magnification except 1A.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2. I.
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2 J

Described by Sawada (1927) on the leaves of ramie, *Boehmeria nivea* (L.) Guad., this is one of the three Sawada's new taxa accepted by Waterhouse (1963). The type culture (ATCC 60238) is indeed a good species, easily recognized by the production in single culture of abundant oogonia with amphigynous antheridia and broadly ovoid to sub-spherical, conspicuously papillate sporangia. Both sporangia and sex organs could be found in Sawada's dried type specimen although the sporangia on the leaf were mostly obpyriform to broadly ellipsoidal.

SPECIMENS EXAMINED : TAIWAN: TAIPEI, on *Boehmeria nivea* , 16 Mar, 18 Oct 1926.

Phytophthora cactorum (L. & C.) Schroet., Krypt. Fl. Schles 3 : 236. 1889. Fig.3

The earliest record of *P. cactorum* in Taiwan was on the leaves of *Boehmeria nivea* in Taipei (Sawada, 1927). On Sawada's dried specimen of ramie we found conspicuously papillate, broadly ovoid to obpyriform sporangia, sometimes arranged in close sympodia, distinctive of this species, but sex organs were absent.

SPECIMENS EXAMINED : TAIWAN: TAIPEI, on *Boehmeria nivea* , 16 Mar, 8 Apr 1924; 7 Feb, 26 Mar, 21 Apr 1925; 12 Feb, 17 Mar, 22 Mar, 23 May 1926.

Phytophthora carica (Hara) Hori, J. Pl. Prot., Tokyo 2 : 1017. 1915.

Phytophthora carica was reported on the fruits of *Ficus carica* L. from Taipei (Sawada, 1916a, 1919c). No Sawada's specimen or culture is available. Waterhouse (1963) considered *P. carica* insufficiently described and "most likely this belongs in group II near *palmivora* ". Based on the conspicuously papillate, elongated ellipsoidal to ovoid sporangia (26-112 x 16-45µm), deciduous with short pedicels and spherical light yellow-brown chlamydospores (mostly 40-45µm) as described by Sawada, we believe that *P. carica* can be treated as a synonym of *P. palmivora* (Butl.) Butl. Katsura (1971) also identified the pathogen causing a white powdery rot of fig fruit in Japan as *P. palmivora* .

Phytophthora cinchonae Saw., Formosan Agr. Rev. 32 : 4-5. 1936.

Phytophthora cinchonae was described by Sawada (1936, 1942b) as a new species causing seedling damping-off of *Cinchona succirubra* Pav. and *C. ledgeriana* Moens in Kaohsiung in 1923. Waterhouse (1963) considered it insufficiently described for lack of information on the sexual organs. Since no type culture or specimen is available, we concur with Waterhouse's judgement that it is "possibly the same as *P. cinnamomi* " based on its wide hyphae (5-15µm), chlamydospore-like swellings (24-53µm), ovoid, internally proliferating sporangia (41.12 x 23.02µm) and diplanetism as described by Sawada. It is puzzling why Sawada did not consider *P. cinnamomi* Rands when he discussed the taxomony of *P. cinchonae* in relation to other *Phytophthora* species known at that time. According to Zentmyer (1980) , *P. cinnamomi* is a pathogen of various species of *Cinchona* , including both type hosts of *P. cinchonae* .

Phytophthora citricola Saw., Rept. Dept. Agr. Gov. Res. Inst. Formosa 27 : 22-24. 1927. Fig.4

Erected by Sawada (1927) as a new taxon on the fruits of *Citrus sinensis* Osb. and *C. tankan* Hay. in Taipei, this is another of Sawada's new species of *Phytophthora* accepted by Waterhouse (1963). The type culture (ATCC 60440) has been examined,

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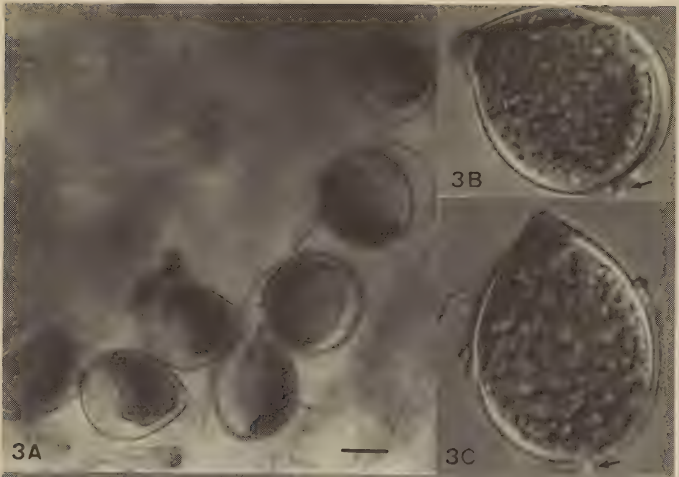
Fig.3. A-C. *Phytophthora cactorum* on *Boehmeria nivea* . A. Sporangia in close sympodium. B, C. Deciduous papillate sporangia with short pedicel (arrow).

Fig.4. A-F. *Phytophthora citricola* (type culture). A-D. Semipapillate sporangia with shallow apical thickenings. E. Oogonium with paragynous antheridium (arrow). F. Oogonium with amphigynous antheridium. Scale bar = 20µm. All at same magnification except 3A,4C.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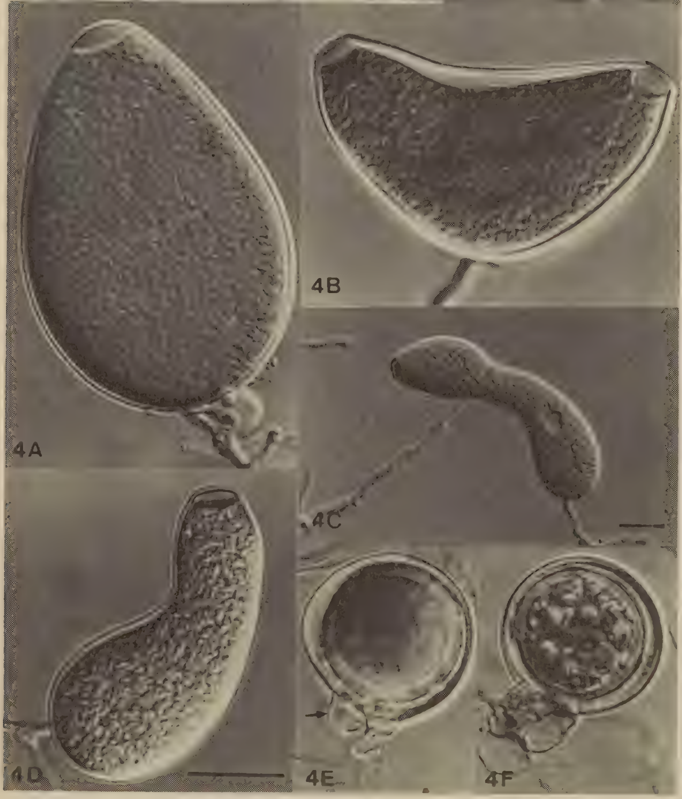
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even though no type specimen is available. *Phytophthora citricola* can be readily distinguished from other *Phytophthora* species by its non-deciduous, ovate to obpyriform semi-papillate sporangia, sometimes asymmetrical, elongated or bifurcate, and the production in single culture of abundant oogonia with predominantly paragynous antheridia.

Phytophthora citrophthora (R. E. Sm. & E. H. Sm.) Leon., Am. J. Bot. 12: 445. 1925.
=*Pythiacystis citrophthora* R. E. Sm. & E. H. Sm., Bot. Gaz. 42 : 221,1906.

In 1913 and 1914, Sawada noticed brown rot on the fruit of *Citrus medica* L. in Taipei, and the pathogen was isolated and identified as *Pythiacystis citrophthora* (Sawada, 1915a, 1919c). Although Sawada left no specimen or culture, there is little doubt that based on the disease symptom, and the papillate oval sporangia (32-64 x 24-36µm) as described by Sawada, that his identification was correct. Citrus brown rot due to *Phytophthora citrophthora* in Taiwan has been confirmed (Ann, 1984).

Phytophthora colocasiae Racib., Parasit. Algenu. Pilze Javas 1 : 9. 1900. Fig.5
=*Kawakamia colocasiae* (Racib.) Saw., Spec. Bull. Agr. Exp. Sta. Gov. Formosa 25 : 79-80. 1911.

Sawada (1911) first identified the pathogen causing destructive leaf blight of *Colocasiae antiquorum* Schott and *C. esculenta* Schott in Taipei as *Kawakamia colocasiae* which was later re-named as *Phytophthora colocasiae* (Sawada, 1915c, 1919c). Sawada's description of the disease symptom and the deciduous, pedicellate, elongated ellipsoidal to oval, papillate sporangia (45-114 x 15-21µm), clearly matches the original description of the species. Sporangia of *P. colocasiae* were found on Sawada's dried specimens. The presence of *P. colocasiae* on taro has been confirmed in every county on the island (Ann *et al* .,1986).

SPECIMENS EXAMINED : TAIWAN: TAIPEI, on *Colocasia* , 17 Oct 1926; 18 Aug 1929.

Phytophthora cyperi (Ideta) Ito, Trans. Sapp. Nat. Hist. Soc. 14 :13. 1935. Fig.6
=*Kawakamia cyperi* (Miy. & Ideta) Miy. Bot. Mag. Tokyo, 17 : 307. 1903.
=*Kawakamia cyperi* (Ideta) Saw., Formosa Agr. Rev. 38 : 351. 1942.

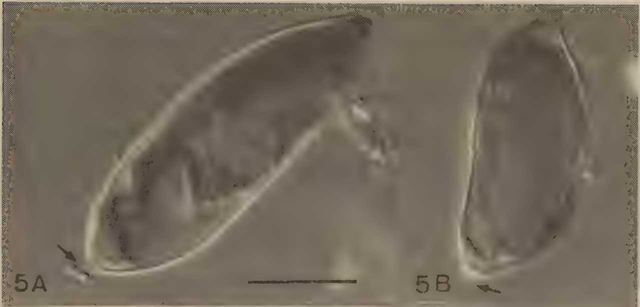
Phytophthora cyperi was first described on the stems and leaves of *Cyperus tegetiformis* Roxb. as *Kawakamia cyperi* (Miy. & Ideta) Miyabe (Sawada, 1915b, 1916b, 1919b) and later on *C. malaccenis* Roxb. as *K. cyperi* (Ideta) Saw. (Sawada, 1942h, 1943). This species has never been grown in culture. We have re-examined Sawada's specimens but could not find the semi-papillate sporangia supposedly produced by the fungus. We found thick-walled, brown, spherical, smooth oogonia. Although Sawada described the antheridia as paragynous, we did find a few amphigynous antheridia.

SPECIMENS EXAMINED : TAIWAN: TAIPEI, on *Cyperus tegetiformis* , 16 Sep 1925; on *C. malaccenis* , Jul 1932, 19 Jun 1933.

Fig.5. A,B. *Phytophthora colocasiae* on *Colocasia* . Deciduous papillate sporangia with pedicel (arrow).

Fig.6. A-D. *Phytophthora cyperi* on *Cyperus* . A. Oogonium with paragynous antheridium (arrow). B. Young oogonium with amphigynous antheridium. C. Oogonium with thick-walled oospore. D. Oospore enclosed within a thin envelop (arrow).

Fig.7. A-E. *Phytophthora cyperi-iriae* on *Cyperus iriae* . A,B. Sporangia. C. Oogonium with paragynous antheridium (arrow). Oogonium with amphigynous antheridium (arrow). Note fertilization tube (FT). Scale bar = 20µm. All at same magnification.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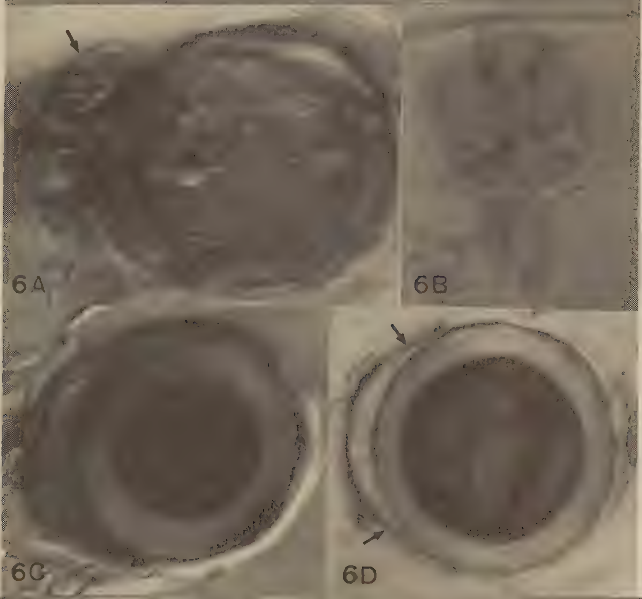
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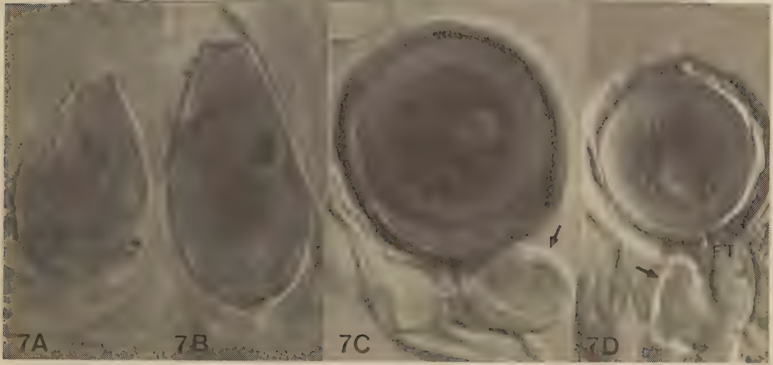
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Phytophthora cyperi-iriae Saw., Rept. Dept. Agr. Gov. Res. Inst. Formosa 51 : 13 1931. Fig.7

=*Kawakamia cyperi-iriae* (Saw.) Saw., Formosa Agr. Rev. 38 : 351. 1942.

Phytophthora cyperi-iriae was recorded on the leaves and peduncles of *Cyperus iriae* L. in Taipei (Sawada, 1931) but later Sawada (1942h, 1943) re-named it as *Kawakamia cyperi-iriae* (Saw.) Saw.. The fungus could not be isolated. A re-examination of Sawada's specimens confirmed most of the characters in the original species description, including the ovoid-ellipsoidal sporangium with round base and flat apex , spherical, brown oogonia with paragynous and occasionally amphigynous antheridia. Sawada distinguished this species from *P. cyperi* primarily based on its "rare" amphigynous antheridia supposedly absent in the latter. Since our experience showed that the antheridia of *P. cyperi* could sometimes be amphigynous, we agree with Waterhouse (1963) that *P. cyperi-iriae* is "probably the same as *cyperi* ".

SPECIMENS EXAMINED : TAIWAN: TAIPEI, on *Cyperus iriae* , 9 Jun 1944.

Phytophthora cyperi-rotundati Saw. Rept. Dept. Agr. Res. Inst. Formosa 27 : 26-28. 1927. Fig.8

=*Kawakamia cyperi-rotundati* (Saw) Saw., Formosa Agr. Rev. 38 : 351, 1942.

Sawada (1927) described the pathogen on the leaves of *Cyperus rotundus* L. in Taipei and Taichung as *P. cyperi-rotundati* and later as *Kawakamia cyperi-rotundati* (Sawada 1942h, 1943). Based on Sawada's dried specimens, this species was similar to *P. cyperi-iriae* in producing semi-papillate, ovoid to ellipsoidal sporangia and spherical brown oogonia with paragynous and occasionally amphigynous antheridia. Sawada characterized *P. cyperi -rotundati* as producing both paragynous and amphigynous antheridia in varying proportions in contrast to the "rare" occurrence of amphigynous antheridia in *P. cyperi-iriae* and the entirely paragynous antheridia in *P. cyperi* . Since all three species are obligate parasites of *Cyperus* spp. causing similar leaf spots, and producing similar sporangia and at least in our study, similar oogonia with paragynous and sometimes amphigynous antheridia, it seems more appropriate to treat them as conspecfic as suggested by Waterhouse (1963).

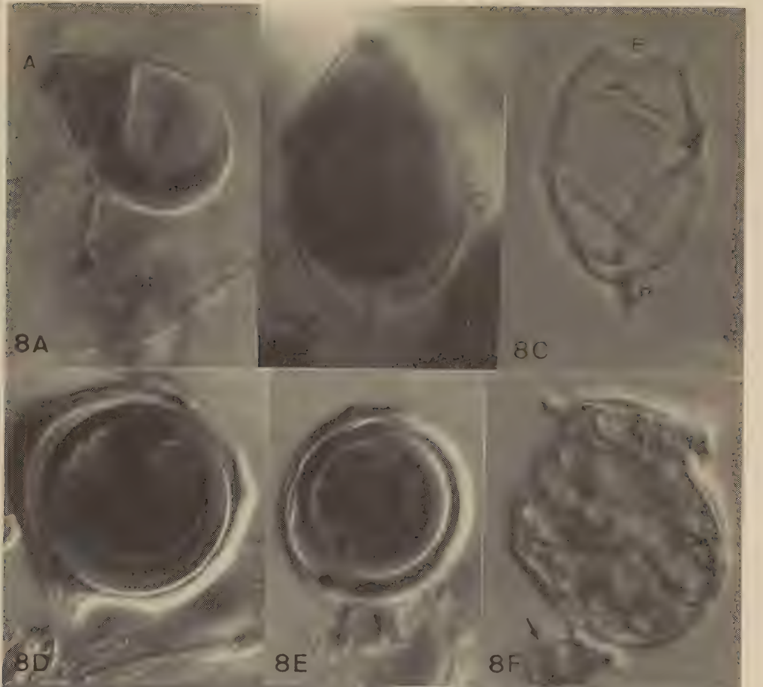
SPECIMENS EXAMINED : TAIWAN: TAIPEI, on *Cyperus rotundus* , 4 May 1924, 11 Nov 1925; JAPAN: KYUSHU, on *C. rotundus* , 25 Oct 1924.

Phytophthora formosana Saw., Formosa Agr. Rev. 38 : 253. 1942.

In 1922, Sawada noticed brown lesions on the leaves of *Ricinus communis* L. at Pintung, Kaohsiung, closely resembling the disease symptoms caused by *P. parasitica* . The pathogen was subsequently isolated. Whereas Sawada(1942g, 43) conceded that the fungus was very similar to *P. parasitica* , he considered it different enough to warrant a new species epithet based on its faster growth rate and slightly larger oogonia and oospores (av. 28.8-30.3µm and 19-24.5µm respectively). We consider these differences minor and within the range of intraspecific variation for *P. nicotianae* (*P. parasitica*)(Ho and Jong, 1989). We concur with Waterhouse (1963) that *P. formosana*

Fig.8. A-F. *Phytophthora cyperi-rotundati* on *Cyperus rotundus* . A. Semi-papillate sporangium to show shallow apical thickening (A). Note sporangiophore emerging from stoma (st). B. Sporangium to show basal plug (B) and pedicel (P). C. Empty sporangium to show exit pore (E) and pedicel (P). D. Oogonium with thick-walled oospore. E. Oogonium with amphigynous antheridium. F. Young oogonium with paragynous antheridium (arrow).

Fig.9. A-D. *Phytophthora infestans* . A. Branched sporangiophore with deciduous sporangia (arrow). B. Sporangium on a nodose sporangiophore branch. C. Sporangium to show apical thickening. D. Sporangium to show basal plug (B) and pedicel (P). Scale bar = 20µm. All at same magnification except 9A,B.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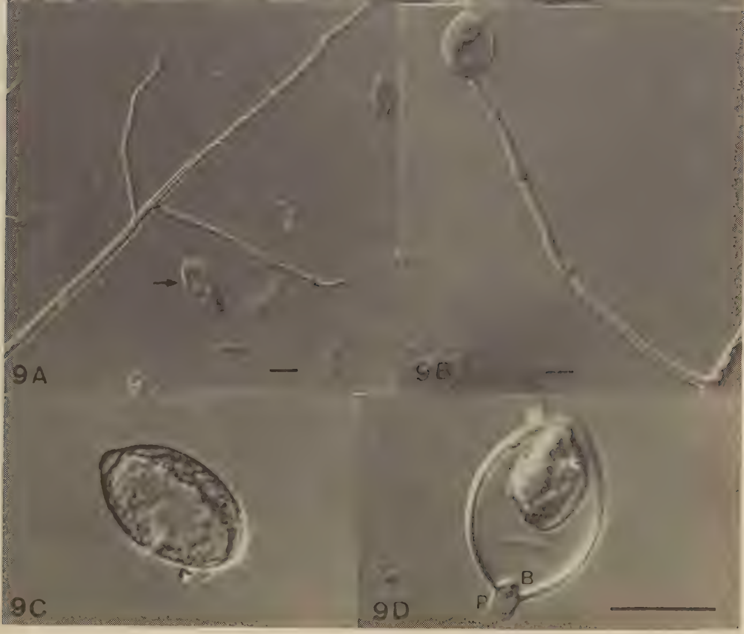
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is "probably the same as *nicotianae* var. *parasitica* " although we do not believe the variety epithet is justified.

Phytophthora infestans (Mont.)de Bary, J. Roy. Agr. Soc. 12 : 240. 1876. Fig.9

Sawada (1915c, 1919c) reported *P. infestans* causing serious late blight of potato (*Solanum tuberosum* L.) and tomato (*Lycopersicon esculentum* Mill.) in Taipei and Taichung, affecting the leaves, petioles, stems, fruits and tubers. On Sawada's dried leaf specimens we found the characteristic aerial, "tree-like", nodose sporangiophore with compound, sympodial branches bearing ovoid papillate sporangia, deciduous with short pedicels. In addition, we came across a specimen of *P. infestans* on the leaves of *Tubocapsicum anomalum* Makino that Sawada collected at Hualien . Apparently, it is a new host for the species but has never been reported by Sawada.

SPECIMENS EXAMINED : TAIWAN: TAIPEI, on *Solanum tuberosum* , 27 Feb 1927, 24 Jan 1931; on *Lycopersicon esculentum* , 24 Jan, 16 Feb 1931; TAICHUNG, on *S. tuberosum* , 2 Aug 1928, on *L. esculentum* , 15 Apr 1930; HUALIEN, on *L. esculentum* , 20 Mar 1931; on *Tubocapsicum anomalum* , 14 May 1919.

Phytophthora leersiae Sawada ex Ho & Chang Fig.10

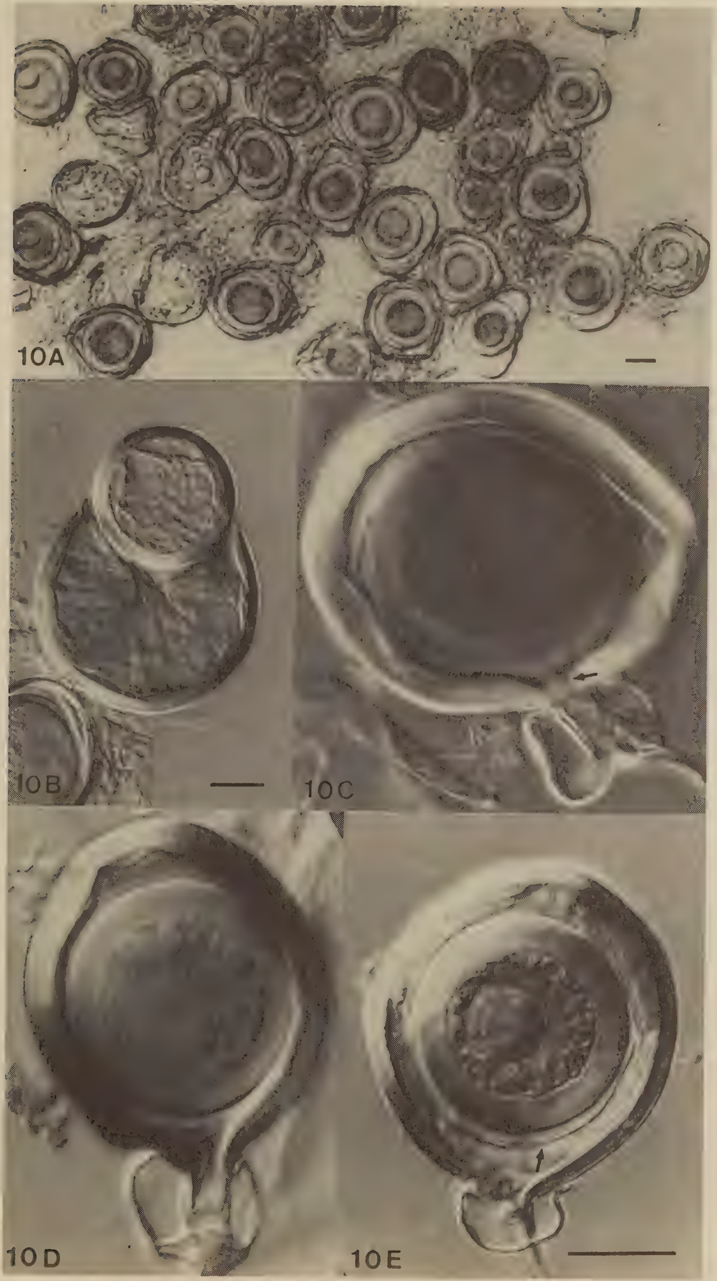
=*Phytophthora leersiae* Sawada, Trans. Nat. Hist. Soc. Formosa 31 : 267. 1941.

Sawada (1941, 1942b) described *P. leersiae* as a new species of *Phytophthora* on the leaves of *Leersia hexandra* Swartz. in Taipei. It was never isolated and has not been reported by other researchers. Our re-examination of the type specimen has confirmed the absence of sporangia and the presence of clusters of brown, exceptionally large, conspicuously thick-walled oogonia often with undulated surface and tapered oogonial base, aplerotic to markedly aplerotic oospore and large entirely amphigynous antheridia as described by Sawada. There are three known species of *Phytophthora* producing large oogonia similar to those of *P. leersiae* : *P. megasperma* Drech., *P. quininea* Crand. and *P. macrospora* (Sacc.) Ito & Tanaka. *Phytophthora leersiae* can be easily distinguished from the former two species by its obligate parasitism, exceptionally thick oogonial wall and entirely amphigynous antheridia. It also differs from *P. macrospora* which produces only paragynous antheridia. Although the asexual stage of *P. leersiae* is not known, the characteristics of its sexual structures are distinct enough for it to be recognized as a good species. To date, amphigynous antheridia are found only in *Phytophthora* and monotypic *Trachysphaera* which is known only on cocoa pods and other tropical fruits and is characterized by bullate oogonial wall (Waterhouse, 1973). Thus, it is justifiable that the fungus on *Leersia hexandra* should be placed within the genus *Phytophthora* until the asexual structures can be ascertained. *Phytophthora leersiae* has been rejected by Waterhouse (1963) for publication after 1935 without Latin diagnosis. To validate its publication in accordance with the International Code of Botanical Nomenclature, a Latin diagnosis is hereby provided based on Sawada's original description of *P. leersiae* :

Mycelia aseptata cum pseudoseptata in hyphae veteres, 6-8 µ diam.; oogonia globosa, globoso-compressa, ovoidea vel raro oblongo attenuata, 45-68 x 28-60 µ, in medio 53.9 x 48.9 µ (ex 9), cum parietis stramineus, 3.5-4 µ latis. Ratio 1.23 inter diam oogonia et oospore. Antheridia amphigyna, globosa, 20-28 x 20-28 µ, in medio 23.9 x 23.5 µ. Conidia non visae.

In follii *Leersiae hexandrae* Sw.

Fig.10. A-E. *Phytophthora leersiae* on *Leersia hexandra* . A. Cluster of oogonia. B. Ruptured oogonium to show smooth oospore and rough textured oogonial wall. C. Oogonium with thick oogonial wall. Note fertilization tube (arrow) from amphigynous antheridium. D. Oogonium with tapered base. E. Oogonium to show aplerotic, thick-walled oospore enclosed by a thin envelop (arrow). Scale bar = 20µm. All at same magnification except 10A,B.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SPECIMENS EXAMINED: TAIWAN: TAIPEI, on *Leersia hexandra* , 4 Jul 1927.

Phytophthora lepironiae Saw., Bull. Agr. Exp. Sta. Gov. Formosa 131 : 10. 1919. Fig.11

=*Nozemia lepironiae* (Saw.) Saw., Spec. Bull. Agr. Exp. Sta. Gov. Formosa 19 : 88. 1919.

=*Kawakamia lepironiae* (Saw.) Saw., Formosan Agr . Rev. 38 : 351. 1942.

Phytophthora lepironiae was first reported on the stems of *Lepironia mucronata* Rich. in Taipei and Taichung by Sawada (1919, a, b) who subsequently renamed it as *Nozemia lepironiae* (Saw.) Saw. (Sawada, 1919c) and then *Kawakamia lepironiae* (Saw.) Saw. (Sawada, 1942h, 1943). He was unable to culture it and this species has not been verified by other researchers. Waterhouse (1963) accepted it as a good species different from *P. cyperi* primarily because of the supposedly broader sporangia and larger oogonia. We could not find sporangia on Sawada's specimens and the oogonia did not appear to be significantly larger than those of *P. cyperi* sensu lato. However, the antheridia were entirely paragynous in contrast to the predominantly paragynous antheridia of *P. cyperi* .

SPECIMENS EXAMINED: TAIWAN: TAIPEI, on *Lepironia mucronata* , 12 Jul 1931.

Phytophthora lycopersici Saw. Formosan Agr. Rev. 38 : 253. 1942.

In 1922, Sawada isolated a *Phytophthora* species from rotten field tomato in Taipei. Since the disease symptom resembled Buckeye rot due to *P. terrestris* Sherb.(=*P. nicotianae* var. *nicotianae* fide Waterhouse, 1963), he compared the pathogen with the latter and found that it was different in having faster growth rate, fluffier colony, and larger oospores (16-28μm) which also distinguished it from *P. melongenae* , *P. parasitica* , and *P. parasitica* var. *rhei* Godf. with oospores 18-21 μm. Its colony morphology was considered distinct from that of *P. nicotianae* and *P. tabaci* . Consequently, he named the fungus *P. lycopersici* which also infected eggplant and citrus fruit in Taiwan(Sawada, 1942e, 43). We share the view of Waterhouse (1963) who considered it "probably the same as *nicotianae* var. *parasitica* ". Sawada's brief mention of rare paragynous antheridia when *P. lycopersici* was grown on *Cyperus* decoction agar medium is of special interest, but he did not refer to this observation in his discussion of its taxonomic status or diagram any paragynous antheridium in his illustration of *P. lycopersici* . No specimen or culture was available for study.

Phytophthora macrospora (Sacc.) Ito & Tanaka, Ann. Phytopath. Soc., Japan 10 : 135. 1940. Fig.12

=*Sclerospora oryzae* Brizi, Nature 10 : 168. 1919.

This species was initially reported on the leaf blades and sheaths as well as spikelets of *Oryza sativa* L. in Taipei by Sawada(1927) as *Sclerospora oryzae* Brizi, causing downy mildew or yellow wilt disease. Thirumalachar *et al* . (1953) made it the type species of the genus *Sclerophthora* partly based on the union of the oogonial wall with the oospore

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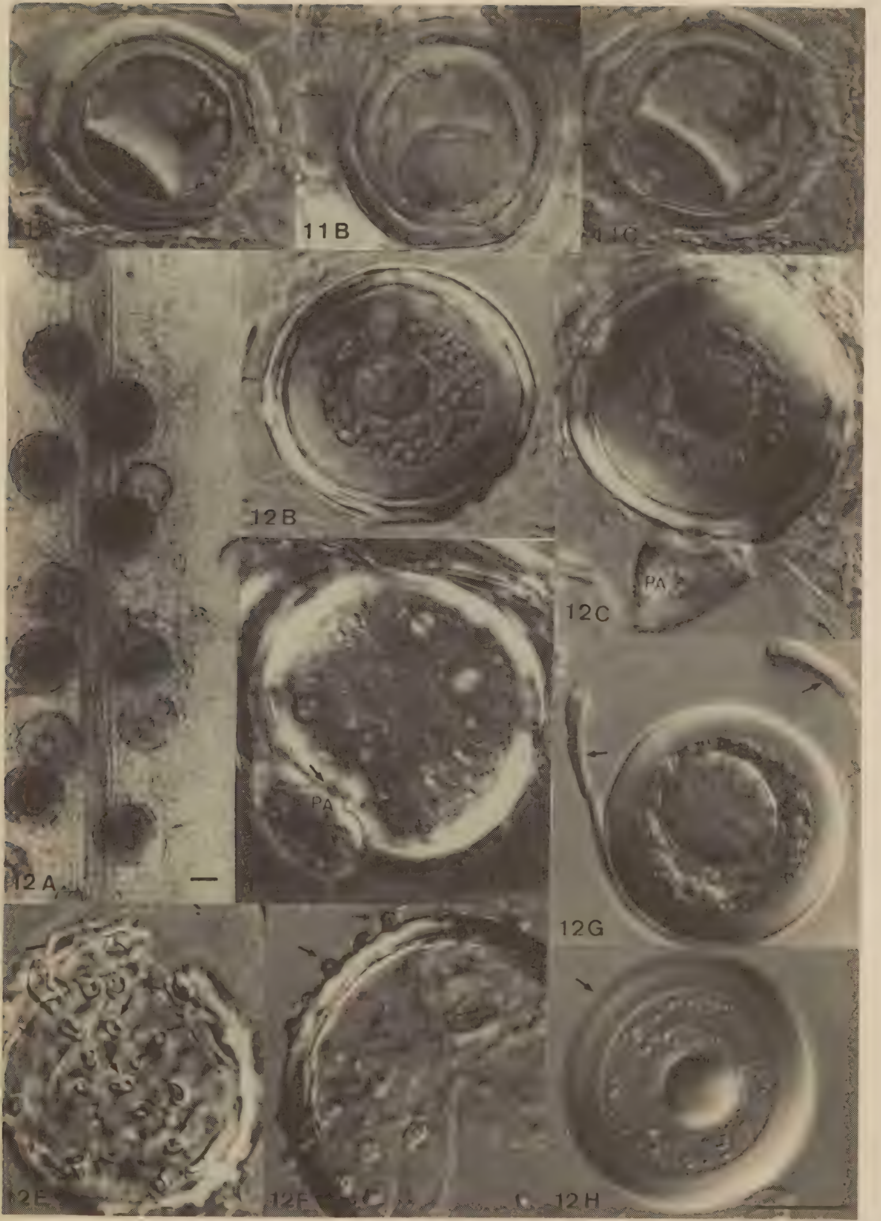
Fig.11.A-C. *Phytophthora lepironiae* on *Lepironia mucronata* . A,B. Oogonia with plerotic oospores. Note the thick, layered walls (arrow) of the oogonium and oospore. C. Paragynous antheridium (arrow) next to the oogonial stalk (st).

Fig.12.A-H. *Phytophthora macrospora* on *Oryza sativa* . A. Parallel rows of oogonia along vascular bundles. B. Large oogonium with thick-walled plerotic oospore. C,D. Paragynous antheridium (PA) attached to oogonium. Note fertilization tube (arrow). E,F. Ornamented oogonial wall with papillae (arrow). G. Oospore with outer thin envelop ruptured (arrow). H. Oospore to show thick layered wall (arrow). Scale bar = 20μm. All at same magnification except 12A.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wall, but Waterhouse (1963) retained it as a species of *Phytophthora* . The taxonomic status of this species is still confusing but for the time being, we have accepted Waterhouse's taxonomic treatment.

On Sawada's specimen, we found abundant distinctively large, thick-walled, tan to brown oogonia close together in parallel series within the leaves. Although the large, hyaline, plerotic oospore nearly fills up the entire oogonial space, the smooth oospore wall is not fused with the oogonial wall. Instead, the intact oospore could be easily released by crushing open the oogonial wall, as experienced by Waterhouse (1963). The paragynous antheridia were hyaline to light yellow. In contrast to the smooth to undulating oogonial wall that Sawada diagrammed, the oogonial wall in Sawada's specimens was often granular with small nipple-like papillae on the surface. Although no sporangia were found on the specimen nor reported by Sawada, this species can be readily distinguished from other *Phytophthora* spp. known only on the hosts by its characteristic large oogonia and oospores.

SPECIMENS EXAMINED : JAPAN: IWATE, on *Oryza sativa* , 19 Jul 1910.

Phytophthora melongenae Saw., Spec. Bull. Agr. Exp. Sta. Gov. Formosa 11 : 77-79. 1915. Fig.13

Sawada(1914) reported the fungus causing fruit rot of *Solanum melongena* in Taipei and described it as a new species(Sawada, 1915c, 1916a, 1919c, 1927). An authentic culture of *P. melongenae* (ATCC 64535) was examined. Based on its irregular, tufted mycelial growth in agar medium, distinctively papillate, broadly ovoid sporangia, spherical chlamydospores and rather small oogonia with short amphigynous antheridia, we agree with Waterhouse (1963) that *P. melongenae* is "the same as *nicotianae* var. *nicotianae* " although we do not believe the variety epithet is needed. Sawada considered *P. melongenae* different from *P. parasitica* primarily based on the lack of haustoria and difference in pathogenicity. Ito (1936) also felt that *P. melongenae* was very similar to *P. parasitica* .

Phytophthora murrayae Saw., Trans. Nat. Hist. Soc. Formosa 32 : 176-177. 1942. Fig.14

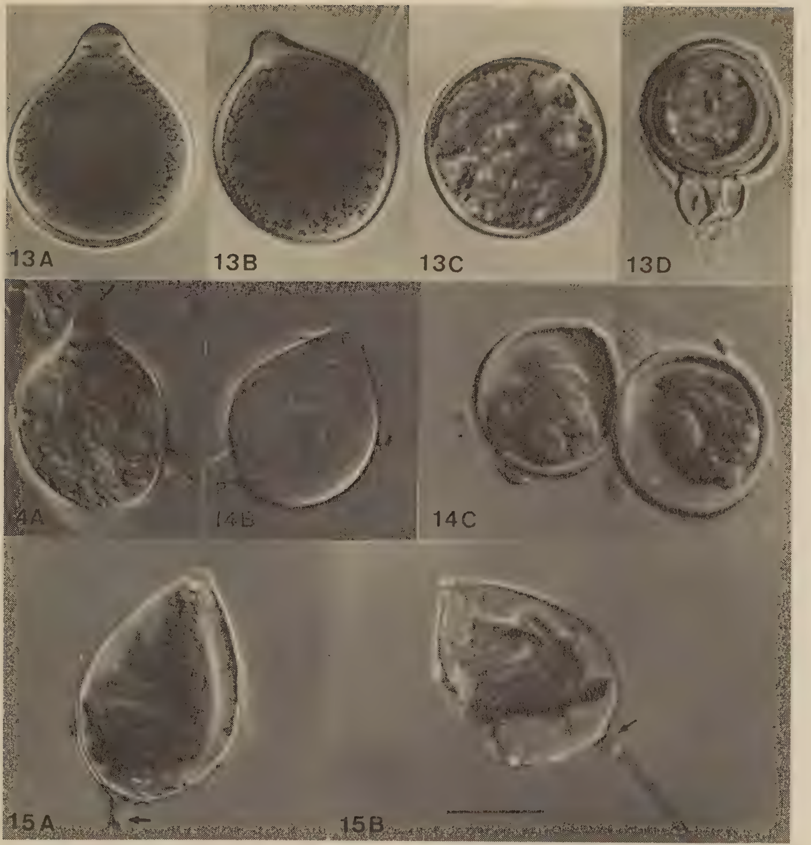
Sawada(1942a, 43) discovered this fungus parasitic on the leaves, petioles and young twigs of *Murraya paniculata* L.(*M. exotica* L.) in Taipei in 1927, resulting in serious defoliation. He erected this new species solely based on the papillate sporangia which were distinct from the nonpapillate sporangia of *P. cryptogea* Pethyb & Laff. and the semi-papillate sporangia of *P. pini* Leon. The culture is no longer available. Although Sawada illustrated this species with three ellipsoidal sporangia, most sporangia that we found on Sawada's dried leaf specimens are broadly obpyriform with distinct hemispherical apical thickenings. We also discovered spherical straw-colored chlamydospores not mentioned in Sawada's description. Based on these findings, we believe it can be treated the same as *P. nicotianae* (*P. parasitica*). Indeed, this species has recently been isolated from the leaves and stem of *Murraya paniculata* at the nursery of National Taiwan University, and the symptoms are similar (Chang, unpublished).

SPECIMENS EXAMINED : TAIWAN: TAIPEI, on *Murraya exotica* , 12 Jun 1928.

Fig.13.A-D. *Phytophthora melongenae* (authentic culture). A,B. Papillate sporangia. C. Chlamydospore. D. Oogonium with amphigynous antheridium.

Fig.14.A-C. *Phytophthora murrayae* on *Murraya exotica* . A. Papillate sporangium with hemispherical apical thickening (arrow). B.Empty sporangium with narrow exit pore (E) and short pedicel (P). Chlamydospores.

Fig.15.A,B. *Phytophthora* sp. on *Ricinus communis* . A. Papillate sporangium with short pedicel (arrow). B. Terminal sporangium on sporangiophore. Note basal plug (arrow). Scale bar = 20μm. All at same magnification.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Phytophthora nicotianae Breda de Haan, Meded. Lands Planten. 15 : 57. 1896.

Sawada (1942d, 1943) reported *P. nicotianae* causing damping-off of *Nicotiana tabacum* L. in Fengyuan, Taichung, first observed in 1919. Neither the isolate nor dried specimen is in existence. Based on its ability to grow at 35 C, conspicuously papillate, spherical to ellipsoidal sporangia (av. 33-48 x 24-36μm) and the tan-colored, spherical chlamydospores (av. 32.32-34.40μm) as described by Sawada, there is little doubt that Sawada's isolate from tobacco in Taichung belongs to *P. nicotianae* .

Phytophthora persica Saw.

Waterhouse (1956) included *P. persica* Saw., in the genus *Phytophthora* and stated that the name was "reported to have been publisted in Agric. Mag. Formosa, 38, 2, p.95, 1942." We have not been able to locate this species in this or any of Sawada's publications on *Phytophthora* . The epithet "*persica* " was not listed under *Phytophthora* or other fungal genera in Sawada's list of fungi found in Taiwan (Sawada, 1961). None of Sawada's *Phytophthora* specimens bears the name *P. persica* . Thus the binomial *P. persica* must be deleted from the genus *Phytophthora* .

Phytophthora polygoni Saw. Rept. Dept. Agr. Gov. Res. Inst. Formosa 2: 32. 1922.

=*Kawakamia polygoni* (Saw.) Saw., Formosan Agr. Rev. 38 : 351. 1942.

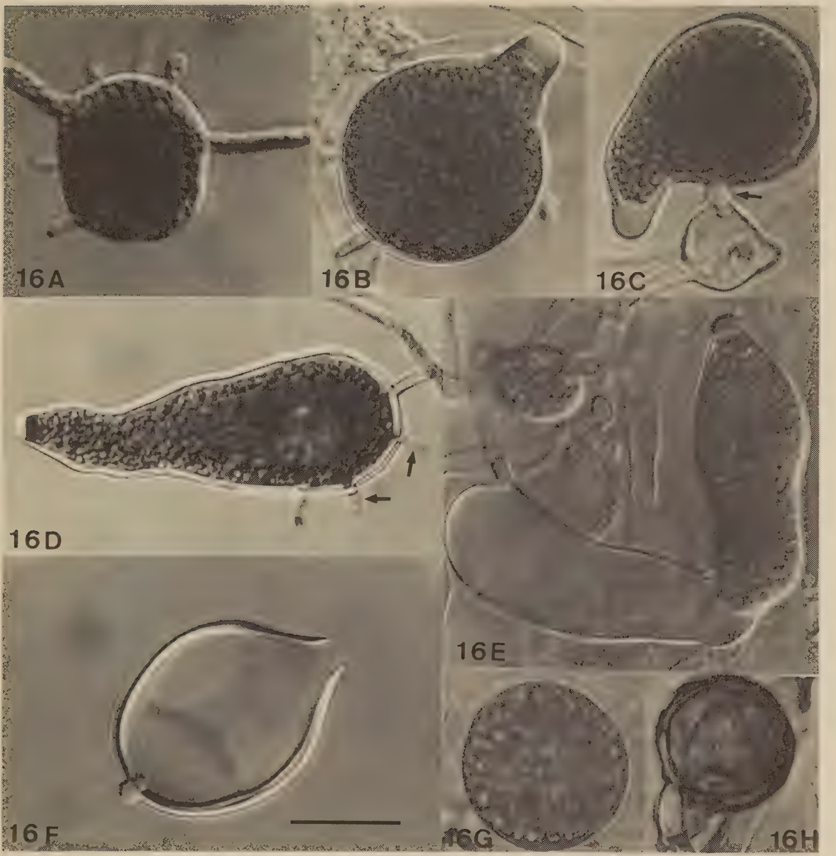
Phytophthora polygoni was discovered on the leaves of *Polygonum japonicum* Meisn. in Taipei and Fengyuan, Taichung (Sawada, 1922) causing leaf spots which gradually expanded resulting eventally in the death of the lower leaves. It was later renamed as *Kawakamia polygoni* (Sawada, 1942h, 1943). It has not been grown in culture and no specimen can be located. Sawada described its sporangia as elongated oblong, oval, pyriform, short spindle-shaped and papillate but the apical thickening was not mentioned in the text nor diagrammed. It was supposed to be distinguished from other *Phytophthora* spp. by its "small, narrowly elongated" sporangia (17-41 x 7-20μm). No sexual structure was found. We accept the judgement of Waterhouse (1963) that this species is insufficiently described to be recognized.

Phytophthora ricini Saw., Formosan Agr. Rev. 38 : 173. 1942. Fig.15

In 1923, Sawada noticed a *Phytophthora* species on the cotyledons and leaves of *Ricinus communis* producing conspicuously papillate sporangia, ovate to elongate oblong, with thick basal septum. It was subsequently isolated and produced on agar medium spherical yellowish brown chlamydospores (av. 31.55-40μm), oogonia (26-32μm) and oospores (24-26μm)with amphigynous antheridia. Sawada(1942f,43) considered its cultural morphology different from *P. tabaci* , *P. nicotianae* , *P. lycopersici* and *P. melongenae* to warrant a new species epithet. No type culture or specimen can be located. We did find dried specimens of *Ricinus communis* leaves from Taipei that Sawada labeled as "*Phytophthora* sp." which showed conspicuously papillate, broadly obpyriform sporangia. Chang and Hsieh (1977) considered *P. ricini* the same as *P. palmivora* based on the rather elongated sporangia in Sawada's diagram. But elongated sporangia were not common on Sawada's specimen of *Ricinus communis.*

In fact, the length/breadth ratio of sporangia produced *in vitro* by *P. ricinis* was determined by Sawada as 1.361-1.507, and the culture grew at 35 C. Furthermore, Sawada found sex organs in single culture of *P. ricini* . Normally, *P. palmivora* almost

Fig.16.A-H. *Phytophthora tabaci* (authentic culture). A. Hyphal swelling with radiating hyphae. B,C. Papillate sporangia with hemispherical apical thickening and basal plug (arrow). D. Sporangium with basal hyphal appendages (arrow). E. Abnormal elongated vesicular sporangium. F. Empty sporangium to show narrow exit pore and basal plug. G. Chlamydospore. H. Oogonium with amphigynous antheridium. Scale bar = 20 μm. All at same magnification.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never produces sex organs in single culture but they can occasionally be found in aged cultures of some isolates of *P. nicotianae* (Ho and Jong, 1989). It seems justifiable to treat *P. ricini* synonymous with *P. nicotianae* based on these evidences. Waterhouse (1963) considered *P. ricinis* "probably the same as *nicotianae* var. *parasitica* ".

SPECIMENS EXAMINED : TAIWAN: TAIPEI, on *Ricinus communis* , 24 Oct, 1 Nov 1923.

Phytophthora tabaci Saw., Rept. Dept. Agr. Gov. Res. Inst. Formosa 27 : 37-38. 1927. Fig.16

Phytophthora tabaci was first isolated from the leaves and stem of *Nicotiana tabaci* in Honshu, Japan in 1924 and was the only Sawada's described *Phytophthora* species found outside Taiwan. Misled by Breda de Haan's diagram of paragynous antheridium for *P. nicotianae* , Sawada considered the Japanese isolate from tobacco different in producing only amphigynous antheridia. It was very similar to *P. melongenae* but differed slightly in hyphal growth pattern and ratio in diameters between oogonia and oospores (Sawada, 1927,42d). An authentic culture of *P. tabaci* (ATCC 64536) was examined. The isolate produced more irregular and elongated sporangia and few chlamydospores . Nevertheless, based on its tufted mycelial growth pattern, ability to grow at 35 C, conspicuously papillate sporangia and the characteristics of the sexual structures, the isolate can be assigned to *P. nicotianae* . Waterhouse (1963) believed that *P. tabaci* is "probably the same as *nicotianae* var. *nicotianae* ".

Phytophthora taihokuensis Saw., Spec. Publ. Coll. Agr. Natn. Taiwan Univ. 8 : 15. 1959.

Phytophthora taihokuensis was isolated from the fruit of *Solanum melongenae* at Luchow, Taipei in 1923, but it was actually published after Sawada's death by Imazeki *et al* . based on his notes. Waterhouse (1963) considered it insufficiently described for the lack of sexual stage. Although Sawada attempted to distinguish *P. taihokuensis* from *P. melongenae* which produced sex organs in culture, both species were isolated from eggplant fruit, had almost identical sporangia (av.41.3 x 32 µm, L/B 1.29 and 42.4 x 33.9 µm, L/B 1.25 respectively) and similar optimal growth temperatures at 30 C. Although no culture or specimen is available for examination, we believe that *P. taihokuensis* is probably the same as *P. melongenae* which can be assigned to *P. nicotianae* . Chang and Hsieh (1977) and Chang (1983) also felt that *P. taihokuensis* is probably the same as *P. parasitica.*

DISCUSSION

Undeniably, Sawada has made significant contributions not only to the study of *Phytophthora* diseases in Taiwan, but also to the taxonomy of the genus *Phytophthora* in general. Three of 16 Sawada's new taxa have been accepted as good species (Waterhouse, 1963). Whereas Sawada's description of *P. lepironae* remains as the only record to date, *P. boehmeriae* and *P. citricola* have been found on various plants in many parts of the world. We propose to recognize also *P. leersiae* based on the unique characterictics of its sexual structures, and have provided a Latin diagnosis to validate its publication. Much of the controversies over Sawada's other new species are attributable to his "splitter" approach in classification based on minor morphological differences which may be accepted by others as intraspecific variation and in some instances, to insufficient information on the taxa. Regrettably, Sawada did not deposit all his isolates with any culture collection centers and many of his dried specimens decomposed due to the warm, humid climate of Taipei and the delicate nature of *Phytophthora* structures. Nevertheless, a re-examination of Sawada's collection has provided much valuable information on his findings, and at the same time uncovered some interesting specimens that were not reported in literature. Of special note is Sawada's specimen of *P. infestans* on *Tubocapsicum anomalum* , apparently a new host record for the species.

ACKNOWLEDGEMENTS

Thanks are due to the National Sciences Council, R. O. C. for financial support, to Professor S. S. Tzean, Department of Plant Pathology, National Taiwan University for making Sawada's specimens available for study, to Dr. S. C. Jong, American Type Culture Collection for providing the cultures, to Dr. A. Sivanesan, C.A.B. International Mycological Institute. for preparation of the Latin diagnosis, to Drs. W. H. Ko and P. J. Ann for reviewing the manuscript, and to Su-Ing Hsu and S. Y. Hsieh for technical assistance.

LITERATURE CITED

Ann, P. J. 1984. Species, mating type and pathogenicity of *Phytophthora* distributed in citrus orchards in Taiwan. Trans. Br. Mycol. Soc. 82: 631- 634.

_____, C. W. Kao, and W. H. Ko. 1986. Mating type distribution of *Phytophthora colocasiae* in Taiwan. Mycopathologia 93: 193-194 .

Chang, H. S. 1983. Crop diseases incited by *Phytophthora* fungi in Taiwan. Plant Prot. Bull.(Taiwan) 25: 231-237.

_____, and H. J. Hsieh. 1977. studies on *Phytophthora* species in Taiwan. Pp. 171-184. In: Symposium on soil-borne crop diseases. Science Council, Taiwan, R. O. C.

Ho, H. H. 1990. Taiwan *Phytophthora* . Bot. Bull. Academia Sinica (Taiwan) 31: 89-106.

_____, and S. C. Jong. 1986. A comparison between *Phytophthora cryptogea* and *P. drechsleri* . Mycotaxon 27: 289-319

_____, and S. C. Jong. 1989. *Phytophthora nicotianae* (*P. parasitica*). Mycotaxon 32: 199-217.

Ito, S. 1936. Mycological Flora of Japan, Vol. 1. Phycomycetes. Yokendo, Tokyo. 340p.

Katsura, K. 1971. *Phytophthora* Diseases of Plants. Seibundo-Shinkosha, Tokyo, Japan. 128p.

Novotel'Nova, N. S. 1974. The genus *Phytophthora* . Sov. Acad. Sci. Bot. Inst., Lening., USSR. 206p.

Sawada, K. 1911. *Phytophthora* disease of taro. Spec. Bull. Agr. Exp. Sta. Gov. Formosa 2: 75-84.

_____. 1914. Materials of the Formosan Fungi (4). Trans. Nat. Hist. Soc. Formosa 19: 210-217.

_____. 1915a. Materials of the Formosan Fungi (5). Trans. Nat. Hist. Soc. Formosa 20: 14-19.

_____. 1915b. Materials of the Formosan Fungi (6). Trans. Nat. Hist. Soc. Formosa 22: 78-85.

_____. 1915c. Two new species of the genus *Phytophthora* causing diseases of onion and eggplant. Spec. Bull. Agr. Exp. Sta. Gov. Formosa 11: 1-139.

_____. 1916a. Materials of the Formosan Fungi (10). Trans. Nat. Hist. Soc. Formosa 26: 174-180.

_____. 1916b. Study on diseases of *Cyperus tegetiformis*. Bull. Agr. Exp. Sta. Gov. Formosa No. 102.

_____. 1919a. Preliminary report on *Phytophthora* disease of Cyperaceae. Formosan Agr. Mag. 146: 8-14.

_____. 1919b. *Phytophthora* disease of the Cyperaceae. Bull. Agr. Exp. Sta. Gov. Formosa. No. 131.

_____. 1919c. Descriptive Catalogue of the Formosan Fungi I. Spec. Bull. Agr. Exp. Sta. Gov. Formosa 19: 1-695.

_____. 1922. Descriptive Catalogue of the Formosan Fungi II. Rept. Dept. Agr. Gov. Res. Inst. Formosa 2: 1-173.

_____. 1927. Descriptive Catalogue of the Formosan Fungi III. Rept. Dept. Agr. Gov. Res. Inst. Formosa 27: 1-62.

_____. 1931. Descriptive Catalogue of the Formosan Fungi IV. Rept. Dept. Agr. Gov. Res. Inst. Formosa 51: 1-131.

_____. 1936. Study on *Phytophthora* disease of *Cinchona* in Taiwan. Formosan Agr. Rev. 32: 1-21.

_____. 1941. Materials of the Formosan Fungi (41). Trans. Nat. Hist. Soc. Formosa 31: 261-267.

_____. 1942a. Materials of the Formosan Fungi (44). Trans. Nat. Hist. Soc. Formosa 32: 176-179.

_____. 1942b. Descriptive Catalogue of the Formosan Fungi VII. Bull. Agr. Exp. Sta. Gov. Formosa 83: 1-159.

_____. 1942c. *Phytophthora* species on tobacco. Formosan Agr. Rev. 38: 7-25.

_____. 1942d. On the differences between *Phytophthora nicotianae* and *P. tabaci* . Formosan Agr. Rev. 38: 7-25.

_____. 1942e. *Phytophthora* species on tomato fruit. Formosan Agr. Rev. 38: 95-111.

_____. 1942f. *Phytophthora* species on the cotyledons of *Ricinus communis* . Formosan Agr. Rev. 38: 173-186.

_____. 1942g. *Phytophthora* species on the leaves of *Ricinus communis* . Formosan Agr. Rev. 38: 253-271.

_____. 1942h. On the species of the genus *Kawakamia* . Formosan Agr. Rev. 38: 351-355.

_____. 1943. Descriptive Catalogue of the Formosan Fungi VIII. Bull. Agr. Exp. Sta. Gov. Formosan 85: 1-131.

_____. 1959. Descriptive Catalogue of Taiwan Fungi XI, Genus *Phytophthora* . P.15. In: National Taiwan Univ. Coll. Agr. Spec. Publ. 8. Eds., R. Imazeki, N. Hiratsuka and H. Asuyama. Natn. Taiwan Univ., Taipei, Taiwan.

_____. 1961. List of Fungi found in Taiwan (Formosa). Pp. 265-354. In: National Taiwan Univ. Coll. Agr. Spec. Publ. 10, Natn. Taiwan Univ., Taipei, Taiwan.

Thirumalachar, M. J., C. G. Shaw, and J. J. Narasimhan. 1953. The sporangial phase of the downy mildew on *Eleusine coracana* with a discussion of the identity of *Sclerospora macrospora* Sacc. Bull. Torrey Bot. Club 80: 299-307.

Waterhouse, G. M. 1956. The genus *Phytophthora* . Diagnoses (or descriptions) and figures from the original papers. Misc. Publ. 12. C. M. I., Kew, Surrey, England. 120P.

Waterhouse, G. M. 1963. Key to the species of *Phytophthora* de Bary. Mycol. Pap. 92. C. M. I., Kew, Surrey, England. 22p.

Waterhouse, G. M. 1973. Peronosporales. Pp.165-183. In: The Fungi, Vol. 4B. Eds., G. C. Ainsworth, F. K. Sparrow, and A. S. Sussman. Academic Press, New York.

Zentmyer, G. A. 1980. *Phytophthora cinnamomi* and the diseases it causes. Monogr. 10. Am. Phytopathol. Soc., St. Paul, MN. 96p.

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SOME NEW OR RARE BASIDIOMYCETES (APHYLLOPHORALES) FROM ITALY

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Summary

A new species is described from Riserva di Burano (Grosseto): Vararia maremmana sp.nov. which resembles Vararia racemosa but differs in having clamped hyphae and amyloid spores. In addition, collections were obtained that are tentatively referred to Hyphoderma multicystidium var. disporum, Antrodia macrospora, characterized by more less irregular pores and long spores, and Phanerochaete aculeata that would be the first record of this taxa in Europe.

Introduction

The mycoflora of Italy, particularly aphyllophoraceous fungi, is poorly and incompletly known. The main contributions include Bresadola's works at the beginning of the century and my own researches in recent years: Bernicchia et al., (1981), Bernicchia and Corbetta (1982), Bernicchia (1984), Ginns and Bernicchia (1984), Bernicchia (1986a), Bernicchia and Ryvarden (1986), Bernicchia et al. (1986), Bernicchia (1986b), Hallenberg and Bernicchia (1987), Bernicchia (1988), Bernicchia and Ryvarden (1988), Bernicchia (1990a), Larsen and Bernicchia (1990), Bernicchia (1990b).

The present paper reports the first results of a research program on wood-inhabiting fungi carried out in a dune area located along the Tirrenic Sea. The Riserva of Burano (Grosseto), a protected Area, is characterized by a double line of dunes that is 3,400 meters long and 150-250 meters wide. They are called 'tombolo' and divide the salt lake of Burano from the Tirrenic Sea. The dunes, up to 9.6 meters high, are covered by a 'macchia' in which *Juniperus oxycedrus* spp. *macrocarpa* (S. et S.) Ball, *J.phoenicea* L. and *Quercus ilex* L. alternatively prevail together with *Phillyrea augustifolia* L., *Myrtus communis* L., *Pistacia lentiscus* L. and sometimes also *Olea europea* var. *sylvestris* Hoffmgg. et Link. Pedrotti *et al.*, (1975, 1982) have noticed in this 'macchia' two different associations both belonging to the *Oleo-Ceratonion* type: the 1st, *Juniperetum macrocarpae-phoeniceae* is only present at the sea-side while the 2nd, *Oleo-Lentiscetum* is widespread the remaining part of the 'tombolo'. The second is characterized by some open areas in which a grass vegetation develops, rich in geophytes and terophytes called *Carex-chaetophylla* type by Pedrotti *et al.* (1975-1979).

The flora of wood-inhabiting fungi will be treated in a later paper. In this communication new taxa and records are presented: one new species in *Vararia*, a *Hyphoderma* that we tentatively call *Hyphoderma multicystidium* var. *disporum* (Buenas et Tell.) Hjorst. et Tell., *Antrodia macrospora* Bernicchia et De Dominicis, and *Phanerochaete aculeata* Hallenb.

Antrodia macrospora Bernicchia & De Dominicis Fig.1

Fruitbody annual, resupinate, adnate, slightly pulvinate, with small isolated rounded or elliptical patches up to 2-6 cm wide and less than 1 cm thick. Margins narrow and smooth. Subiculum very thin and almost absent at the margins, whitish or cream. Tubes irregular, sometimes with an irpiciform appearance up to 0.5 mm thick at the margin and 2-3 mm in central part. Pore surface white to cream; pores regular or irregular, rounded, elongated, rounded-angular, angular to almost irpiciform or semilamellate, 1-2 per mm. Dissepiments thick, entire, becoming lacerated when thin and old.

Hyphal system dimitic: generative hyphae hyaline, smooth or slightly encrusted, branched, septate and clamped, thin-walled, 2-4 um diam in the subhymenium, thick-walled and 2-5 um diam in the context. Skeletal hyphae thick-walled to almost solid, rarely septate and branched, straight to sinuous, more or less interwoven, 3-6 um diam. Cystidia none, but numerous mostly clavate or fusoid cystidioles, 30-70 x 7-9 (-12) um, are present projecting slightly above hymenium. Sterigmata short and blunt then slender and (3-) 4-6 (-7) um long. Basidiospores hyaline, smooth, thin-walled, cylindrical to slightly concave at one side and convex at the other, with some oil drops in the protoplasm, IKI^{-}, 12-18 x (-3,5) 4-5.5(-6) um. The spores are extremely variable even in the same collection (Figure 1).

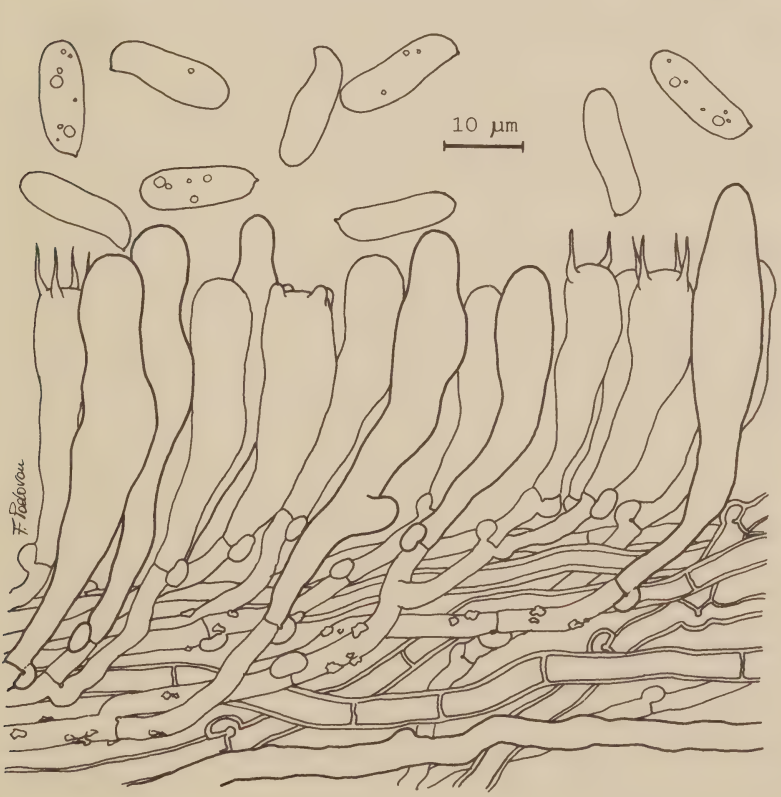

Figure n. 1: Hymenial structure of Antrodia macrospora

Habitat: Mediterranean area from the beginning of November to the end of January. It is rapidly destroyed by insects.

Distribution: collected only in the dune area of Riserva di Burano.

Macroscopically it resembles *A.ramentacea* (Berk. & Curt.) Donk, but microscopically it is characterized by longer spores, numerous cystidioles, and occurring only on hardwood.

Specimens examined: coll. 5102 on *Phillyrea* 29.XI.89; coll. 5116 on *Phillyrea* 29.XI.89; coll. 5135 on *Phillyrea* 15.1.88; coll. 5153 on *Quercus pubescens* 15.1.88; coll. 5191 on *Quercus pubescens* 22.XI.88; coll. 5192 on *Phillyrea* 15.1.88 (Herb. Universitatis Bononiensis).

Collected many times in the 'Riserva di Burano' (Grosseto) on *Phillyrea angustifolia* and twice on *Quercus pubescens* Willd. at the margins of the forest, associated with a brown rot (Bernicchia, 1990b).

Hyphoderma multicystidium var. *disporum* (Buenas et Tell.) Hjorst. et Tell. Fig. 2

Fruitbody resupinate, orbicular to confluent, smooth, membranaceous, white to cream, becoming darker to almost ochraceous in older or exsiccate specimens. Margin thin, indeterminate. Hymenium smooth and continuous to the naked eye, finely reticulate and tomentose under a 50x lens.

Hyphal system monomitic: subicular hyphae hyaline, thin-walled, richly branched, clamped, 2-3 um diam; densely interwoven in the subhymenium. Cystidia very numerous, cylindrical, flexuous, thin-walled or slightly thick-walled, 40-70 (-80) x 3-6 um, projecting 20-30 um above hymenial surface, contents homogeneous. Basidia cylindrical-clavate, somewhat constricted in the middle, hyaline, with a basal clamp, contents with numerous oil drops, always with two stout sterigmata 5-7 um long. Basidiospores hyaline, smooth, thin-walled, ellipsoid, IKI^{-}, with numerous small or a few larger oil drops, 8-9,5 (-10)x(4-)4.5-5.5 um (Figure 2).

Habitat: on still- attached twigs or small branches of *Helichrysum italicum* (Roth) Don lying on the ground.

Distribution: collected twice in Riserva di Burano (Grosseto) during the late autumn and the beginning of the winter of 1989 in a dune area of Mediterranean machia.

Specimens examined: coll. 5109 on *Helichrysum italicum* 29.XI.89; coll. 5207 on *H.italicum* 21.02.90 (Herb.Universitatis Bononiensis).

According to K.H. Larsson (pers.comm.) it could be compared with *H.obtusum* Erikss., but easily separated from it by microscopical characters (shape and size of spores, basidia always with two sterigmata). For the moment I prefer to call it H.*multicystidium* var. *disporum* and will

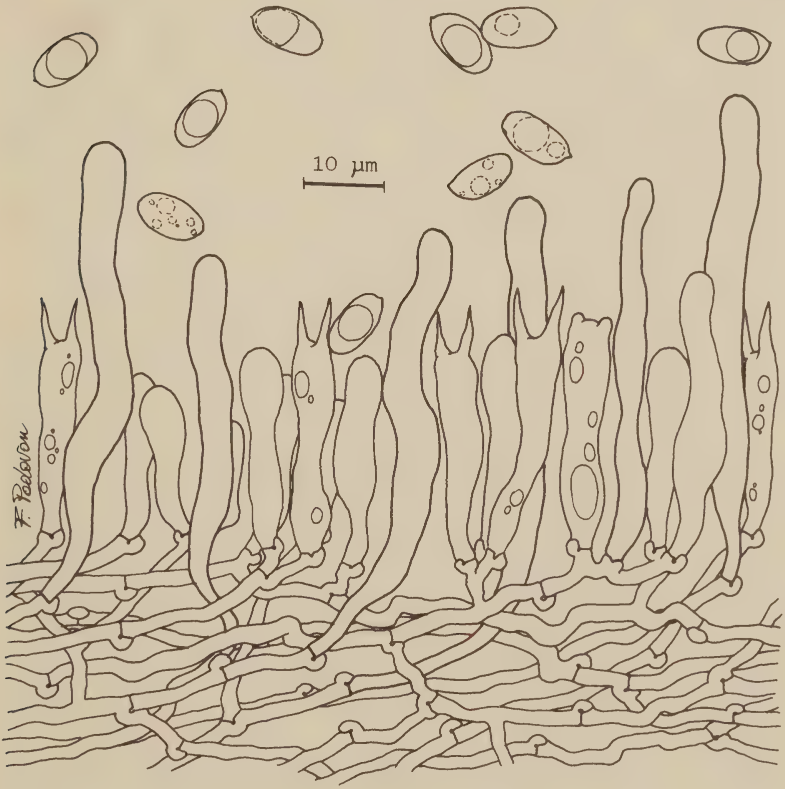

Figure n. 2: Hymenial structure of *Hyphoderma multicystidium* var. *disporum*

decide on its final disposition after looking at the type of Fibricium multicystidium Hjorst. et Ryv. and Hyphoderma multicystidium var. disporum.

Vararia maremmana Bernicchia, sp. nov. Fig. 3

Carposomata adnata. Exiguas laminas fere ellipticas, crustosas, subtiles conficit. Hymenium laeve, rimosum in vetustioribus partibus, ochraceum. Margines tenues indistincti. Systema hypharum dimiticum: hyphae generativae hyalinae, ramosae, fibulatae, (1.5-) 2-3 um latae, tenuitunicatae vel leviter crassitunicatae. Dichohyphae crassitunicatae terminalibus partibus valde ramosis, crassitunicatis. Rami dichohypharum breves, aliquando cum crystallis, dextrinoidei. Cystidia extenuata, hyalina, leviter crassitunicata, 20-30 x 3-6 um lata. Basidia hyalina, utriforma, 4 sterigmatibus et fibula basali instructa, 15-20 um longa, 4-5 um lata. Sterigmata gracilia, procera, 3-3.5 um longa. Basidiosporae subcylindraceae, leviter flexae ad unam partem, leves, tenuitunicatae, amyloideae, (5.5-) 6-7 (-7.5) x 2.2.-2.7 um.

Varariae racemosae similis sed differt fibulatis hyphis et sporis amyloideis.

Holotypus: Riserva di Burano (Grosseto) in vivo trunco Juniperi phoeniceae L., 29.XI.89, coll. A. Bernicchia n. 5121 (Herb. Universitatis Bononiensis).

Fruitbody effused, adnate, single to confluent, 0.5-2 cm long, usually ellipsoid, crustaceous, pale ochraceous; margin thin. Hymenium smooth, continuous to rimose. Hyphal system dimitic; generative hyphae hyaline, clamped, branched, densely interwoven, not easily separable, thin-walled to slightly thick- walled, (1.5-)2-3 um diam. Dichohyphae densely ramified, -15-40 (-50)x 20-35 (-40) um, cyanophilous. The branches short, thick-walled, dextrinoid, sometimes incrusted, 1-2 um diam. Cystidia numerous, hyaline, fusoid, thin-walled or slightly thick-walled, 20-30 x 3-6 um. Basidia 15-20 x 4-5 um hyaline, utriform, with 4 sterigmata and a basal clamp. Sterigmata slender, thin, 3-3.5 um long. Basidiospores hyaline, smooth, thin-walled, subcylindrical and somewhat concave on one side, IKI^+, (5.5-)6-7(-7.5)x 2.2-2.7 um.

Habitat: on living trunk of Juniperus phoenicea in Riserva di Burano (Grosseto).

Specimens examined: coll. 5121 on Juniperus phoenicea 29.XI.89 (Holotype); coll. 5108 on J.phoenicea 29.XI.89; coll. 5208 on J.phoenicea 21.02.90 (Herb. Universitatis Bononiensis).

Distribution: found only in a restricted area along the Tirrenic coast during the autumn of 1989. It is similar to V.racemosa Hallenb. but differs in having frequent hyphal clamps, basidia with basal clamps, and spores uniformly amyloid (only at the supra hilar region in V.racemosa, N. Hallenberg pers. comm.) (Figure 3).

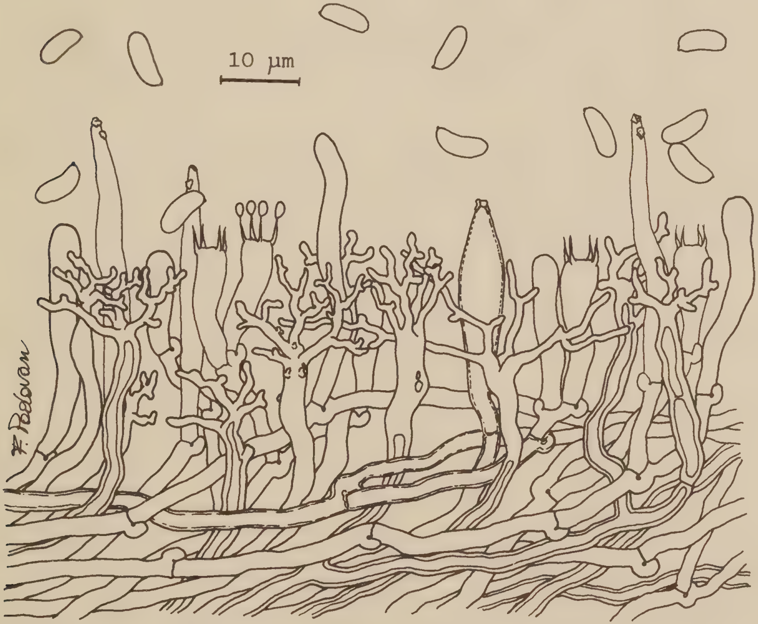

Figure n. 3: Hymenial structure of Vararia maremmana.

Phanerochaete aculeata Hallenb. Fig. 4

Collected only once in the dunes of Marina di Nicotera in the southern part of Italy (Reggio Calabria), growing on an old fruitbody of Phellinus punctatus (Fr.) Pil. For a description see Hallenberg (1978).

The collection is very well developed, about 15 cm long and 10 cm wide with many spores and numerous very characteristics cystidia. It is the first find in Europe. This is not the only time that I have found the same rare corticioid fungi in the southern part of Italy that Hallenberg has found in Iran (Figure 4).

Coll. examined: coll. 5111 on an old *Phellinus punctatus* growing on *Quercus suber* L., 6.X.89 (Herb. Universitatis Bononiensis).

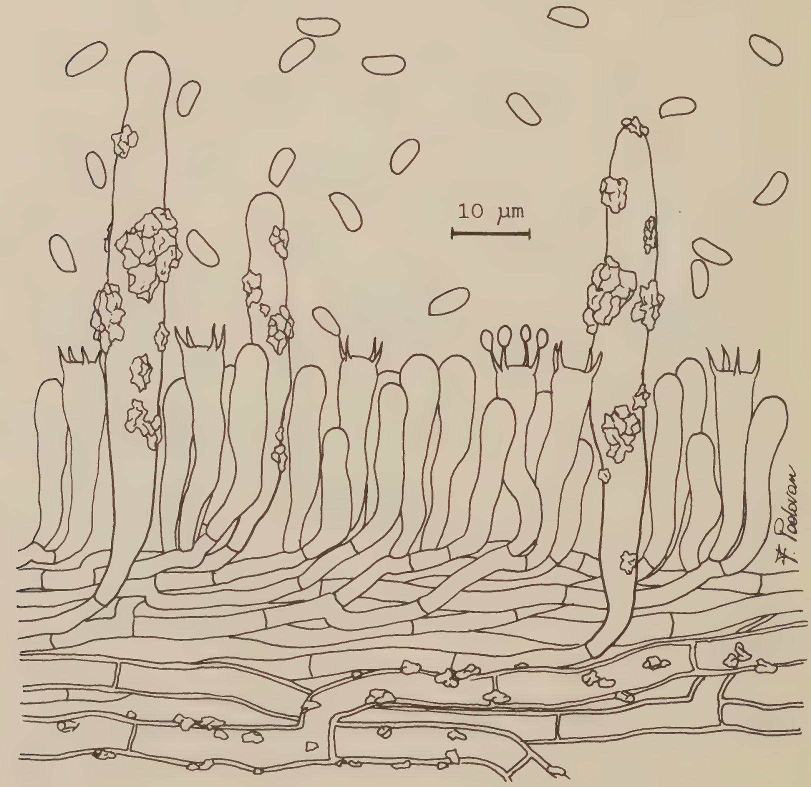

Figure n. 4: Hymenial structure of *Phanerochaete aculeata*.

Acknowledgment

I would like to express my special appreciation to Dr. N. Hallenberg and Dr. K.H. Larsson, University of Göteborg for their help. I am grateful to Dr. F. Padovan who has contributed the illustrations. I further acknowledge Dr. M.J. Larsen, who kindly reviewed the manuscript and improved the English in the text.

References

BERNICCHIA A., CAMPADELLI G. and FURIA A.. 1981. Some wood-inhabiting aphyllophoraceous fungi from Italy: St. Vitale Pine-Forest (Ravenna). First contribution. Informatore Botanico Italiano, 13: 130-140.

BERNICCHIA A. 1984. Some rare and interesting aphyllophoracous fungi from Italy. Nova Hedwigia, 40, 381-386.

BERNICCHIA A. & CORBETTA F. 1982. Aphyllophorales del Bosco della Mesola (Ferrara). Giorn.Bot.Ital., 116, 5-6: 255-268.

BERNICCHIA A. 1986. Some rare and interesting aphyllophoraceous fungi from Italy. II contribution. Nova Hedwigia, 42, 2-4: 417-421.

BERNICCHIA A. *et al.* 1986. Introduzione alla conoscenza delle Aphyllophorales della Sardegna. I contributo. Micol.Ital., 1:45-60.

BERNICCHIA A. & RYVARDEN L. 1986. Some Polyporaceae from Circeo National Park. Mycol.Helvetica, 2(1): 67-78.

BERNICCHIA A. 1986. *Dendrothele nivosa* (Corticiaceae) in Italy.Mycol.Helvetica, 2 (1): 79-83.

BERNICCHIA A. 1988. Introduzione alla conoscenza delle Aphyllophorales della Sardegna. Secondo contributo. Boll.Bresadola, 2-4: 176-194.

BERNICCHIA A. & RYVARDEN L. (1988). *Aleurodiscus ilexicola* Bern. & Ryv. sp.nov.from Sardinia. Mycol.Helvetica, 3(1): 83-88.

BERNICCHIA A. 1990. The genus *Dendrothele* Höhn. et Litsch. in Italy. Nova Hedwigia, 51, 3-4: 453-458.

BERNICCHIA A. 1990. Polyporaceae s.l. in Italia, edito a cura dell'Istituto di Patologia Vegetale dell'Università degli Studi di Bologna, pp. 596.

ERIKSSON J. and RYVARDEN L. 1975. Corticiaceae of North

Europe, Vol. 3 Fungiflora, Oslo, pp. 288-546.

GINNS J. & BERNICCHIA A. 1984. Flaviporus semisupiniformis (Polyporaceae) in Italy. Mycol. Helvetica, 1(3):185-188.

GILBERTSON R.L. and RYVARDEN L. 1986. North American Polypores, Vol. 1 Fungiflora, Oslo, pp. 433.

HALLENBERG N. 1978. Wood-fungi (Corticiaceae, Coniophoraceae, Lachnocladiaceae, Thelephoraceae) in N. Iran I. Iran J. Plant Path. 14:38-87.

HALLENBERG N., 1985. Lachnocladiaceae and Coniophoraceae of North Europe. Fungiflora, Oslo, pp. 96.

HALLENBERG N. & BERNICCHIA A. (1987). Cultural studies in Fibricium (Corticiaceae, Basidiomycetes), Mycotaxon, XXX:203-208.

LARSEN M.J. & BERNICCHIA A. 1990. Lindtneria panphyliensis sp. nov.from Po Valley, Italy. Mycotaxon, XXXVII, 349-352.

PEDROTTI F., ORSOMANDO E., CORTINI PEDROTTI C., 1975. Carta della Vegetazione del Lago di Burano e della duna di Capalbio (Grosseto), Firenze, L.A.C.

PEDROTTI F., ORSOMANDO E., CORTINI PEDROTTI C., 1982. La duna di Capalbio. Excursion Iternational de Phytosociologie en Italie centrale (2-11 juillet 1982) Guide itineraire: 51-564.

PEDROTTI F., CORTINI PEDROTTI C., ORSOMANDO E., 1979. The phytoscociological map of Burano (Tuscany). Webbia 34: 529-531.

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A NEW **HYPHOMYCETE** FROM SANTIAGO RIVER.V. **BLOXAMIA CREMEA.**

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Abstract: **Bloxamia cremea** is described from Santiago river, and characters distinguishing it from the other species of the genus are considered.

Working with the fungal flora of Santiago river the species described below was collected.

Bloxamia cremea Arambarri, Cabello et Cazau. Fig. 1-4.

Conidiomata sunt sporodochialia, superficialia, sparsa, elliptica, vel formae et magnitudinis variabilia, 500-1000 um. Statu udo pulvinata, mucosa et cremea succinea, statu sicco cremea et contracta. Interdum statu sicco sporae exsiccatae protudunt ut columna minuta, alba, longitudinaliter striata. Stroma basale paucus cellulis compositum. Conidiophora macronemata, ramosa, septata, hyalina, tenuitunicata, laevia, 30-40um x 1,5-2 um. Cellulae conidiogenae discretae, integratae, terminales, monophialidicae, determinatae, laeves, brunneus, cylindricum, 24-26 x 2,5-3 um. Conidia endogena, catenata, cylindrica, hyalina, aseptata, laevia, guttulata, 3-4 x 1-1,5 um.
In cortice putridis, Rio Santiago, Buenos Aires, III/1989 Holotypus LPS 45018
Etymology: cremea refearing to the creamy colour of the conidiomata.

Conidiomata sporodochial, superficial, scattered, cushion shaped, elliptical or variable in shape and size, reaching 500-1000 um, slimy and cream coloured or white when wet, when dry creamy coloured with horny consistency, with the dry spore mass produced in chains and adhering in tall, columnar aggregates, up to 300um. **Sporodochia** with a basal flat stroma, formed by few cells. **Conidiophores** macronematous, erect, profusely branched, hyaline, smooth walled, septate, 30-40 x 1,5-2 um. **Conidiogenous cells** discrete, terminal, monophialidic, determinate, smooth walled, brown, cylindrical 24-26 x 2,5-3 um. **Conidia** endogenous, catenate, cylindrical, hyaline, aseptate, smooth, guttulate, 3-4 x 1-1,5 um.

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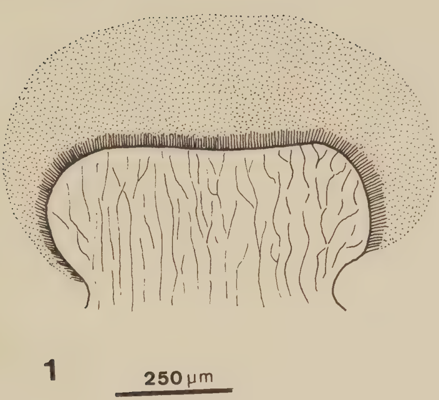
In the Monograph of **Chalara** and allied genera (Nag Raj & Kendrick, 1975) two species of **Bloxamia** were described: **B. nilagirica** (Subramanian) Nag Raj et Kendrick and **B. truncata** Berk. et Br. Coppings and Minter (1980) described later **B. sanctae-insulae** and Minter and Holubová-Jechová (1981) **B. bohemica**. **B. nilagirica** can not be confused because it forms synnemata. The differences between the other species are summarized in the following table:

Comparation of **Bloxamia cremea** and the other species described.

	B. cremea	B. truncata	B.bohemica	B.sanctae-insulae
Conidiomata	white to creamy	black	amber	brown to black
	500-1000um	500um	2000um	1500um
Conidiophore	30-40x1,5-2um	15-32 2-3um	--	--
Conidiogenous cells	cylindrical dark-brown	cylindrical subhyaline -pale brown	lageniform pale brown	lageniform pale brown
	24-26x2,5-3um	15-32x2-3um	16-22x1,5-2um	15-21x1,5-2,5um
Conidia	in long and slimy chains	single or easily dispersible chains	catenate	catenate
	cylindrical	short cylindrical to oblong	cylindrical	globose
	3-4x1-1,5	2-4x1,5-2	3-5,5x1	2um
	3,5:1	1,5:1	4:1	---

The closest species is **B. truncata** but differs from **B. cremea** specially by the colour of the conidiomata, the long chains of conidia and the shape of them .

1.Conidiomata sporodochial, general aspect; 2.Conidiophore; 3.Conidiogenous cell; 4. Conidia.



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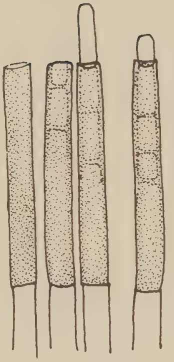

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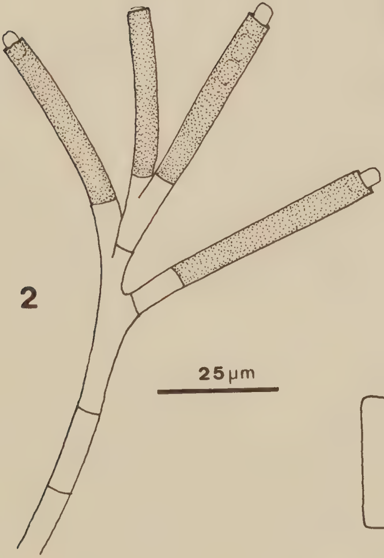

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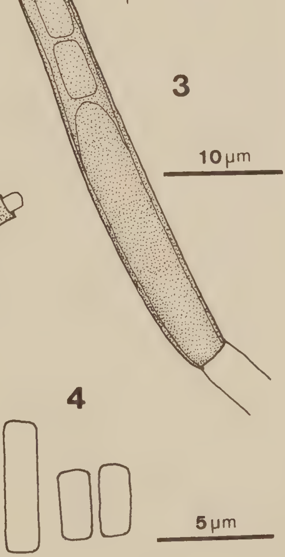

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Key to the species of **Bloxamia.**

1. -Fructification a synnema............ **B. nilagirica**
1´.-Fructification a sporodochium........2
    2. -Conidiogenous cell cylindrical...3
    2´.-Conidiogenous cell lageniform....4
        3.-Conidiogenous cell dark brown, conidia in long chains. Conidiomata white to creamy...... ....**B. cremea**
        3´.-Conidiogenous cell hyaline to subhyaline. Conidia singly. Conidiomata black..... ....**B. truncata**
        4.-Conidiomata amber. Conidia cylindrical... ....**B. bohemica.**
        4´.-Conidiomata brown to black. Conidia globosa ....**B. santae-insulae**

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REFERENCES

COPPINS, B.J. & D.W. MINTER. 1980. A new Hyphomycete from Northumberland. Notes R.B.G. Edinb. 38(2): 363

MINTER D.W. & V. HOLUBOVA-JECHOVA. 1981. New or interesting Hyphomycetes on decaying pine litter from Czekoslovakia. Folia Geobot. Phytotax. Praha, 16: 195-217.

NAG RAJ T.R. & B. KENDRICK. 1975. A monograph of Chalara and allied genera. Wefrid Laurierr University Press. Waterloo, Ontario Canada.

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PATENCY OF SHIELDS IN WATER MOUNTED SPORES OF FOUR SPECIES IN ACAULOSPORACEAE (GLOMALES)

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SUMMARY

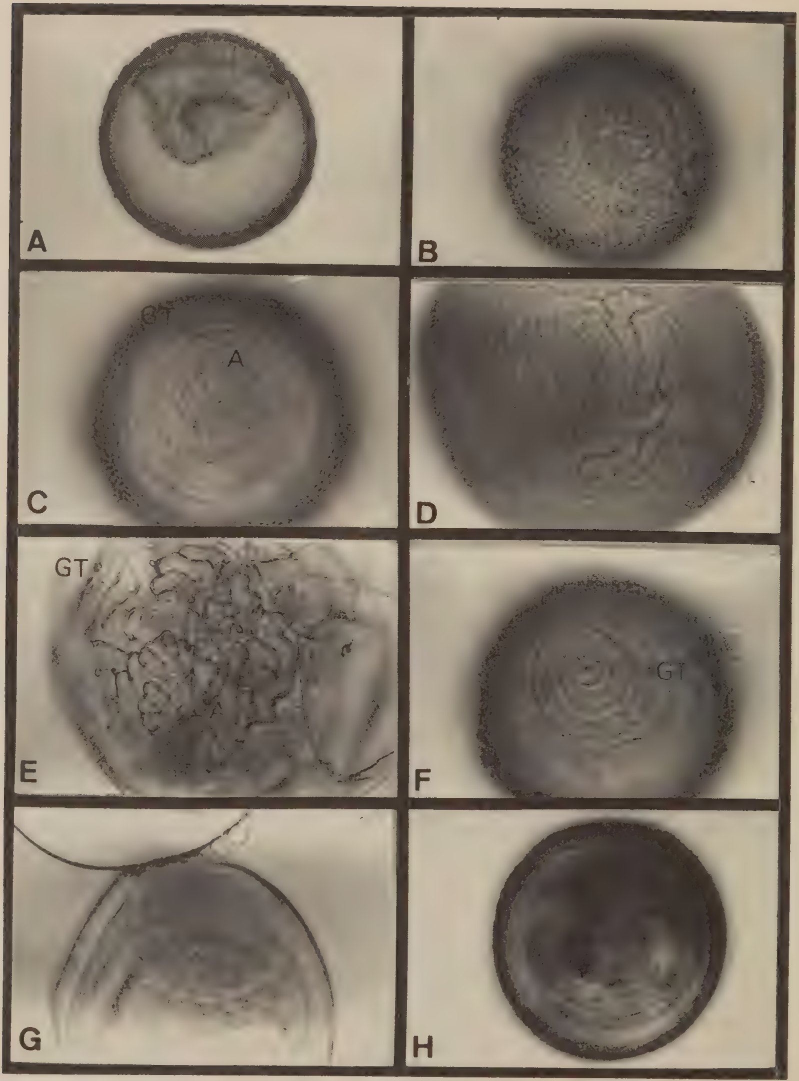
Shields of *Acaulospora rehmii* Sieverding & Toro, *A. scrobiculata* Trappe, *A. tuberculata* Janos & Trappe and *Entrophospora colombiana* Spain & Schenck can be seen in plan view if germinated spores are mounted in water. This finding will introduce germination characters for taxonomic consideration. The ephemeral nature reported for some shields may be due to the effect of commonly used mountants (polyvinyl-lactic acid-glycerine [PVLG] and lactophenol) on a fragile structure.

SUMÁRIO

Escudos de germinação de *Acaulospora rehmii* Sieverding & Toro, *A. scrobiculata* Trappe, *A. tuberculata Janos & Trappe and Entrophospora colombiana* Spain & Schenck podem ser observados em plano se os esporos germinados são montados em água. Consequentemente, as características de germinação poderão ser consideradas também como elemento para análises taxonômicas. A natureza efêmera atribuí à alguns escudos pode ser em parte devida ao efeito de montantes comumente utilizados (polivinil-ácido lático-glicerina [PVLG] e lactofenol) em uma estrutura frágil.

METHODS

Germinated spores with intact shields were recovered from pot cultures of several different



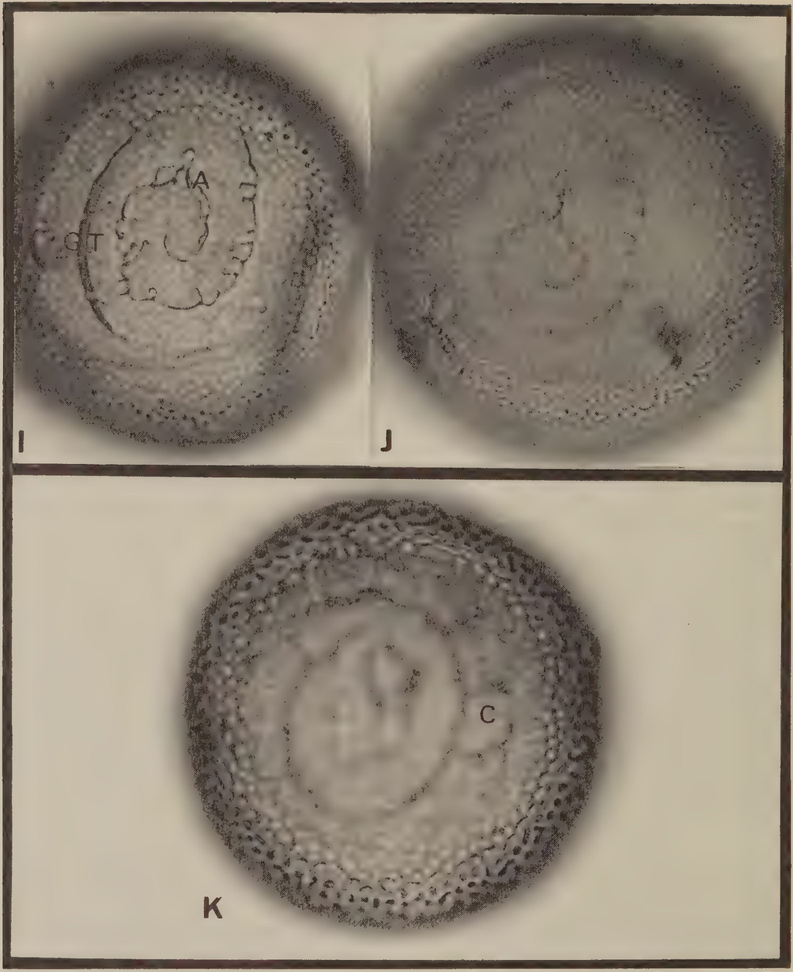
Figs. A-F: Germinated spores in Acaulosporaceae mounted in water (X 400). **A-B**: *A. rehmii; C: A. scrobiculata;* **D**: *A. tuberculata*; **E**: *A. tuberculata*, inner wall group; **F**: *E. colombiana*. **Figs. G-H**: Pre-germination structure of *E. colombiana* (**G**: water mount; **H**: Melzer's reagent plus water). A: Aperture; GT: Germination tube locus.

ages by carefully pouring a water suspension of soil, roots and spores onto a sieve with a considerably smaller opening (53µm) than the size of the spores. Water was added and the suspension agitated gently and decanted several times between sieves of the same size or from a beaker to the sieve. The washed spores were decanted into a glass Petri dish.

Germinated spores were recognized by the absence of cytoplasmic content. Their increased translucency was more obvious against a black plate (or a mirror) on the stereoscope stage. The innermost wall group of these spores often was collapsed or partially collapsed below the shield (Figure A). Germinating spores of the unornamented species, *E. colombiana* Spain & Schenck, were identified by polar aggregations of dense cytoplasm separated by oil globules. Germinating ornamented spores were not as easily recognized.

Germinating or germinated spores of similar size were suspended in a water drop on a slide. The drop was carefully covered with a coverslip (18 X 18, No. 1 thickness). Individual shields were oriented on the microscope stage by gently moving the coverslip with a dissecting needle while focusing (200-400X). Small amounts of water were added as needed to keep the specimen from collapsing under the weight of the coverslip.

The germination shield with the attached collapsed inner wall group was removed intact from germinated spores by fracturing the outer wall group (Fig. E). This practice was not essential even for viewing shields of ornamented spores with light microscopy. The brittle outer wall group enclosing inner walls turgid with cytoplasm (germinating spores or spores with developing shields) was fractured by gently tapping (#11 scalpel blade) spores placed on very moist filter paper. The fractured wall was removed by carefully rolling spores over the uneven surface of the filter paper (Figs. G & H).



Figs. I-K: Water mounts of germinated spores of two species in Acaulosporaceae from the same pot culture (400X). **I & J**: Shields of *A. scrobiculata* and *A. rehmii* show remarkable similarity; in mixed culture the two species were indistinguishable at the stereoscope level of magnification (40X). **K**: Peripheral compartments are visible in shield of *A. scrobiculata*. Spores of *A. scrobiculata* show marked variation in pit size and shape. A: Aperture; C: Compartment; GT: Germ tube locus.

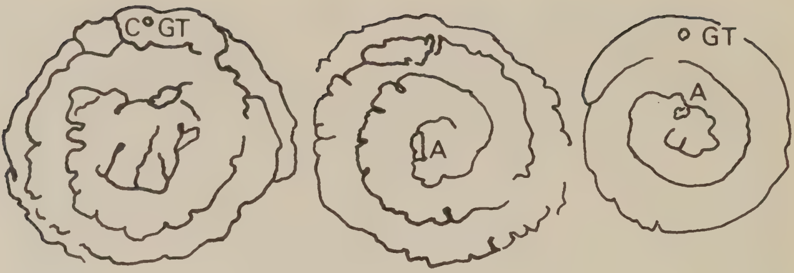
OBSERVATIONS

Water mounts of germinated (empty of cytoplasm) and germinating spores of *A. rehmii* Sieverding & Toro, *A. scrobiculata* Trappe, *A. tuberculata* Janos & Trappe and *E. colombiana* revealed patent germination shields visible in both transverse and plan view (Figs. A-D & F). Large germinated spores rarely were recovered apparently because of their greater fragility; most were small to mid-size. The shields, formed by cytoplasm flowing through an aperture, ranged from a simple orb, *E. colombiana* (Figs. F-H), to the more complex spiral configurations found in *A. rehmii*, *A. scrobiculata* and *A. tuberculata* (Figs. B- E). Shield configurations were consistent within the species; shields of *A. rehmii* and *A. scrobiculata* were so similar they could not be distinguished by morphological features (Figs. I-J).

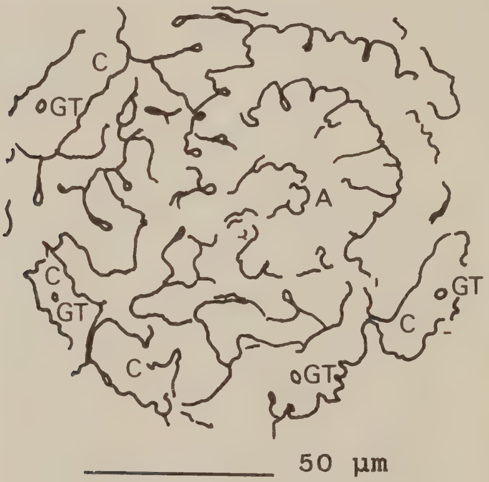
The outer wall group of the fragile germinated spores often collapsed in lactophenol and sometimes collapsed in PVLG. Manipulation of the spore (to orient the shield) in either mountant often caused the shield to detach or collapse. The mountants had an especially deleterious effect on the structure of the immature shield.

DISCUSSION

Although germination in the Acaulosporaceae Morton & Benny (1990) is of considerable taxonomic interest, it has received scant attention at the species level because of an inability to observe a plan view of the shield. In a classic study of honey-coloured sessile Endogone spores (*A. laevis* Gerdemann & Trappe) Mosse (1970a) reported changes in wall structure and cytoplasmic organization from early spore formation to germination. The detailed account of the shield (germination compartments), viewed in cross-section, was drawn from observations of fixed spores sectioned for electron and light microscopy. Morton & Benny (1990) published a transverse view of the germination shield of *A. delicata* mounted in PVLG, however, they concluded shields were ephemeral based on their inability



A. scrobiculata　*A. rehmii*　*E. colombiana*



A. tuberculata

Fig. L. Camera lucida drawings of germination shields of four germinated spores of Acaulosporaceae suspended in water. *Acaulospora rehmii*, *A. scrobiculata* and *A. tuberculata*: native spore collection, CPAC / EMBRAPA; Planaltina, D.F., Brasil; *E. colombiana*, Carimagua collection: CIAT; Cali, Valle, Colombia.
A: Aperture; C: Compartment; GT: Germ tube locus.

to see any structure in plan view or in transverse view when the spore walls were fractured. The author's attempts to use PVLG and lactophenol as mountants for germinated spores were often unsuccessful and almost never successful for pre-germinating spores. The ease of obtaining plan views using water mounts suggests that the problem was due, in part, to the PVLG mountant.

Taxonomic consideration for germination characters is now possible because of the observation that shields of some spores in Acaulosporaceae are patent in water mounts. Morton & Benny (1990) note that *Acaulospora* and *Entrophosphora* share a large number of character states. Parallel sequences in spore ontogeny and organization are notable e.g. *A. dilatata* and *E. colombiana* have indistinguishable wall structures, excluding hyphal [sporophore] attachment(s). A study of *A. dilatata* will reveal whether shield morphology follows the same pattern.

Mosse (1970a) reported that germination compartments (shields) were formed in *A. laevis* by cytoplasm accumulating between walls after splits occurred. This interpretation differs from observations of the four species studied: the cytoplasm forming the shield entered through an aperture in the wall proximal to the innermost wall (Fig. L). Some germination tubes were observed emerging from peripheral compartments (Fig. L) separated from the rest of the shield; however, this feature was not a constant in the spores examined.

Mosse (1970a) and Gerdemann & Trappe (1974) noted the similarity of germination between honey-coloured sessile *Endogone* spores (*A. laevis*) and *E. calospora* (*Scutellospora calospora* [Nichol. & Gerd.] Walker & Sanders) and *Gigaspora gilmorei* (*S. gilmorei* [Trappe & Gerd.] Walker & Sanders). The germination shields of *Scutellospora* and the four species in Acaulosporaceae form in the same way: cytoplasm enters between flexible walls through a hole [aperture] (Walker & Sanders, 1986). Germination tubes emerge from loci near the periphery or from loci within peripheral 'compartments'. Shields of both *Scutellospora* and Acaulosporaceae have fissures (internal walls), however, the simple (*E. colombiana*) to more complex spiral orbs (*A. rehmii*, *A. scrobiculata* and *A. tuberculata*) are morphologies not reported for *Scutellospora*.

Old, Nicolson & Redhead (1973) noted correspondence between the three innermost wall layers (walls) of *S. nigra* and *A. laevis* when the transmission electron microscope study of *S. nigra* was compared with the TEM study by Mosse (1970c). Although they observed the layer showing radial periodicity described by Mosse, they did not observe the 'tri-partite' membrane nor find equivalence in the outer layers (walls). Although shields of Acaulosporaceae and *Scutellospora* form between appressed flexible walls, spores mounted in PVLG show differences in the wall types associated with germination. Shields in the Acaulosporaceae form below a semi-rigid unit wall and above the beaded membranous wall; *Scutellospora* shields form between membranous or coriaceous and membranous or coriaceous walls (Morton, pers. comm.).

Shield similarity in Acaulosporaceae and Gigasporaceae gives a false impression of relatedness. The similarity is one of convergence because other characters are not congruent. Morphological characters or character complexes unique to each family have been discussed by Morton & Benny (1990).

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LITERATURE CITED

Gerdemann, J.W. and J.M. Trappe (1974). The Endogonaceae in the Pacific Northwest. Mycologia Memoir No. 5. The New York Botanical Garden, Bronx, New York.

Morton, J.B. (1990). Evolutionary relationships among arbuscular mycorrhizal fungi in the Endogonaceae. Mycologia 82:192-207.

Morton, J.B. and G.L. Benny (1990). Revised classification of arbuscular mycorrhizal fungi (Zygomycetes): a new order, Glomales, two new sub-orders, Glomineae and Gigasporineae, and two new families, Acaulosporaceae and Gigasporaceae, with an emendation of Glomaceae. Mycotaxon 37:471-491.

Mosse, B. (1970a). Honey-coloured, sessile *Endogone* spores. I. Life history., Arch. Mikrobiol. 70:167-175.

Mosse, B. (1970b). Honey-coloured, sessile *Endogone* spores. II. Changes in fine structure during spore development. Arch. Mikrobiol. 74:129-145.

Mosse, B. (1970c). Honey-coloured, sessile *Endogone* spores. III. Wall structure. Arch. Mikrobiol. 74:146-159.

Old, K.M., T.H. Nicolson, and J.F. Redhead (1973). A new species of mycorrhizal Endogone from Nigeria with a distinctive spore wall. New Phytol. 72:817-823.

Walker, C. and F.E. Sanders (1986). Taxonomic concepts in the Endogonaceae: III. The separation of *Sculellospora* gen. nov. from *Gigaspora* Gerd. & Trappe. Mycotaxon 27:169-182.

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CULTURAL, ENZYME AND GENETIC STUDIES IN THE GENUS FLAMMULINA Karst.

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SUMMARY

Mycelial cultures of three European species of the genus **Flammulina - Agaricales, Basidiomycotina** (**F. fennae** Bas, **F. ononidis** Arnolds, **F. velutipes** (Curt.:Fr.)Sing.) have been studied.

The morphological, physiological and cytological characteristics of the species and their enzyme activities are described. The features that can be used for species identification were followed. The results were used for construction of a dichotomic key for species identification.

Taxonomic evaluation of the species **Flammulina ononidis** and **F. velutipes** was based on compatibility tests of monosporic mycelia. Negative interfertility tests support the existence of two different species.

INTRODUCTION

The genus **Flammulina** Karst. includes six species. European species are **F. fennae** Bas, **F. mediterranea** (Pacioni et Lalli) Bas et Robich, **F. ononidis** Arnolds, **F. velutipes** (Curt.:Fr.)Sing., extraeuropean ones are **F. callistosporioides** (Sing.)Sing. and **F. ferrugineolutea** (Beeli)Sing..

Flammulina velutipes (Syn.:**Collybia velutipes**) has been cultures since the last century (Van Tieghem 1879) and has been investigated by a number of authors interested in wood-decaying fungi (e.g. Falck 1902, Nobles 1948, 1965) and also by authors interested in a wider range of basidiomycete cultures (e.g.Semerdžieva 1965, Buchalo 1988). It has been also used as a model culture for characterization of individual mycelial structures (Miller 1971, Ingold 1980a,b,,Watling 1983). The abundant literature on the species **Flammulina velutipes** was summarized and evaluated by Psurceva (1987). The development and cytology of arthrospores (oidia) of **F. velutipes** were studied by Brodie (1936), an extensive genetic study of the species including crossing of monosporic mycelia from different localities was performed by (Takemaru (1961). Intercompatibility tests between strains of **F. velutipes** identified as **F. velutipes var. velutipes f.velutipes, F. velutipes var. velutipes f. longispora** Bas and **F. velutipes cf. var. lactea** (Quél.) Bas were described by Lamoure

(1989b). Enzyme activities of **Flammulina velutipes** were also investigated in detail (e.g. Boidin 1951, Lyr 1958, Käärik 1965, Kawai and Mukai 1970, Koenigs 1970, Buchalo et al.1971, Bresinsky and Besl 1979, Marr 1979 and Mišurcová et al. 1987. Other species studied by us - **F. fennae** and particulary **F. ononidis** in culture were only rarely studied. Some characteristics of **F. fennae** were described by Lamoure (1989 a), a brief description of the mycelium and its compatibility with **F. velutipes** were presented by Stalpers (Bas 1983). In addition to the morphological and microscopic description of the cultures and screening of enzyme activity of all species, it was the aim of the present work to justify the existence of a separate species **F.ononidis** on the basis of crosses of monosporic mycelia with **F. velutipes.**

MATERIAL AND METHODS

The culture used here are stored at the Culture collection of macromycetes, Institute of Toxicology and Forensic Chemistry, Charles University at Prague. The strains under study are as follows:

Flammulina fennae Bas
culture obtained from Centraalbureau voor Schimmelculture , Baarn (CBS), culture No. 419.83

F. ononidis Arnolds
I. 19.XII. 1979, Bohemia borealis, České Středohoří (Bohemia Hills), dist. Louny, Raná hill, on Ononis spinosa; isol. from spores
II. 17.III. 1981, Bohemia borealis, České Středohoří (Bohemia Hills), dist. Louny, Mnichov, on Ononis spinosa; isol. from stipe
21 monosporous mycelia were obtained from this strain

F. velutipes (Curt.:Fr.)Sing.
I. **F. velutipes var. velutipes f. longispora** Bas 11.XII. 1979, Bohemia centralis, Prague-Košíře, on deciduous tree; isol. from spores
II. 24.XII. 1989, Bohemia centralis, dist. Beroun, Srbsko, on deciduous tree; isol. from spores
15 monosporous mycelia were obtained from this strain
III. **F. velutipes var. velutipes f. velutipes** 16. IV. 1990, Bohemia meridionalis, dist. Strakonice, Neuslužice, on soil under Coryllus avellana;isol.from spores
6 monosporous mycelia were obtained from this strain

All isolates were cultivated on malt extract agar -MEA (agar 15g, malt extract (Difco) 10g, demineralized water 1000 ml, pH 6- 6.5)in Petri dish 90 mm in diameter, with 20 ml medium. Incubation was carried out in the dark in a thermostat at $24^{0} \pm 0.5^{0}$C.

Cultural characteristics were examined after 14 -21 day cultivation macroscopically and microscopically (magnif. 1000 x using Melzer´s reagent and phloxine).Colours are given according to Kornerup and Wanscher (1987). Macro and micro characteristics were completed by changes after one, four and nine month cultivation. The HCl- Giemsa method (fixation: ethanol-acetic acid 3:1, hydrolyse 7 min at $60^{\circ}C$ in 1M HCl, staining 40 min at $40^{\circ}C$) was used for caryological study.

Monosporic mycelia were obtained from spore print of fruit bodies collected in nature (**Flammulina velutipes**) or cultivated in laboratory on a straw substrate(**F. ononidis**). The spore print was suspended in sterile water and suitable dilutions were spread on an agar plate. After a 5-d cultivation the minor, hardly visible colonies were reinoculated. Ten-days old colonies were examined microscopically. Uninuclear character was controlled after Giemsa staining (see above). Incompatibility tests were performed by crosses of monokaryotic mycelia of both species in all possible combinations. In case of mycelial contact the border of contact was examined under microscop.

Enzyme activity has been studied. Oxidoreductases: 1. Spot tests (laccase - as substrates used syringaldazine, 1-naphtol and guaiacol; peroxidase - p-phenylendiamine tartrate and 3% H_2O_2; catalase - 10% H_2O_2). 2. Plate diffusion method (tyrosinase - L-tyrosine); all oxidoreductases according to Klán and Baudišová (1990 b)). Hydrolases: 1. Plate diffusion methods (lipase - Tween 80 and 20; lecithinase - soybean lecithin; amylase - starch and Lugol solution; proteases - gelatine or dried milk; milk clotting enzymes - dried milk; urease - urea and phenol red; according to Klán and Baudišová 1990 a)) and cellulases - 1.5% agar, 1% pepton, 1% microcrystalline cellulose, pH 6.5. After six day incubation, the Petri dishes were overlaid with 1 ml 1 M HCl and 5 ml 0.5% Iodine solution in 2% KI. 2. Cytochemical methods (α--glucosidase — 6-brom 2- naphtyl-α-D-glucopyranoside, ß-galactosidase — 6-brom -2-naphtyl-ß-D-galactopyranoside; Klán et al. 1989).

RESULTS

Macroscopic and microscopic characteristics and enzyme activities of three species of the genus **Flammulina** were described (see Table 1). A key was proposed for identification of mycelial cultures of the studied species on the basis of their characteristic features.

All compatibility tests between **Flammulina ononidis** and F. **velutipes** (both **longispora** and **velutipes** forms) were negative, when 17 monokaryotic mycelia of F. **ononidis** from one locality and 20 mycelia of F. **velutipes** from two localities were used.

No fructification was observed at the temperature of $24^{\circ}C$; F.**velutipes** and F.**ononidis** species readily fructificate at low temperatures (up to $10^{\circ}C$) on malt agar, straw or apple-carrot agar.

The odour in all three species is inconspicuous, not very well-defined, musty.

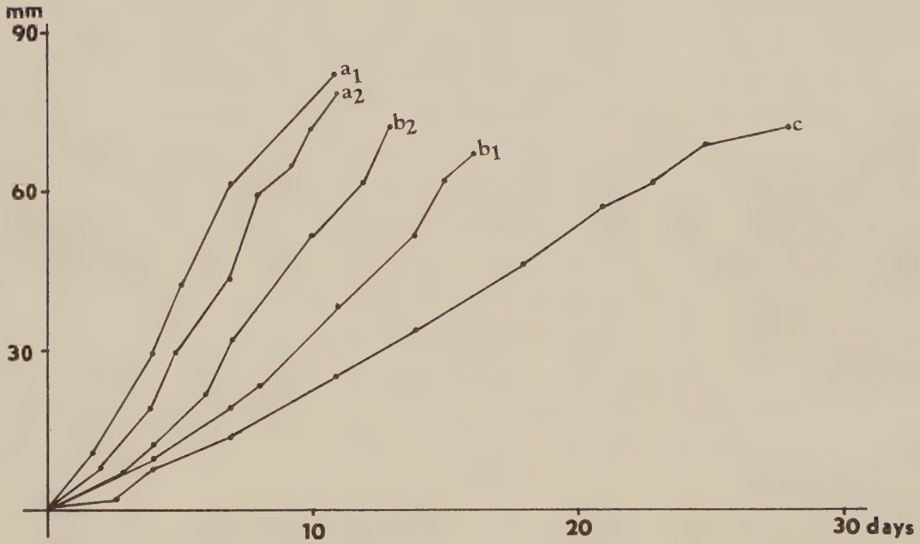

Fig. 1 Growth curves of the species a_1) a_2) **Flammulina velutipes** (strains I and II respectively), b_1) b_2) **Flammulina ononidis** (strains I and II), c) **Flammulina fennae**

Flammulina fennae Bas
Syn. **Collybia velutipes f. aestivalis** Sing.

The culture grows moderately well, the colony attaining 80 mm in 27 days. The growth does not alter the colour of the nutrient medium. Aerial mycelium compact, very sparsely powdery with marked radial filamentation, advancing zones with ciliate rim. Profile of the colony flat, margin regular, lineated, finely ciliate. The colour is yellowish, to yellowish orange (Tab. 4, A6), colony turns darker with age. Guttation not observed.

Aerial hyphae are thin-walled, 1.5-3 µm in diam. Clamp connections very often, anastomoses were observed, projections very rare. Club like terminal cells of hyphae, 10 µm in diam, thick walled (Fig. 2). Hyphae with short cells (5-10 µm) frequent. After 4 month rare arthrospores, ovoid to bullet shaped, 5-7 µm x 1-3.2 µm.

Hyphae dikaryotic, arthrospores monokaryotic, club-like terminal cells dikaryotic.

Flammulina ononidis Arnolds

Dikaryotic culture grows well, colony attaining 80 mm in 17 days. The growth does not alter the colour of the nutrient medium. Aerial mycelium wooly with outlined advancing zones. The margin of the colony regular, inconspicuously demarcated, peripheral hyphae are the same as the whole colony. The colour is white (A1), guttation fine, colourless.

Aerial mycelium thin walled, 1.2-3.3 µm in diam., often corrugate. Clamp connections frequent, anastomoses observed. After a 3-month cultivation cylindrical arthrospores (5-15 x 1.2-2.3 µm) observed; in monokaryotic mycelium the same arthrospores observed already 10 days after germination of basidiospore.

Hyphae dikaryotic, arthrospores mostly monokaryotic.

Flammulina velutipes (Curt.:Fr.)Sing.
Syn. **Collybia velutipes** (Curt.:Fr.)Kumm.

Dikaryotic culture grows well, colony attaining 80 mm in 10 days. The growth does not alter the colour of the nutrient medium. Aerial mycelium sparsely wooly, growing zones not observed. Profile of the colony flat, the margin of the colony regular, inconspicuously demarcated, peripheral hyphae with the same character as the whole colony. Colour whitish to yellowish white (Tab. 3-4, A2). Guttation not observed.

Aerial hyphae thin walled 2-5.2 µm in diam. Clamp connections frequent, anastomoses rare, branching at angle of 30-60°. Arthrospores observed already on the day 7 of the culture, cylindrical, oval, sometime crescent-shaped, 3-15 x 2-5 µm (Fig. 3). In two strains of monosporic mycelia (**F. velutipes var. velutipes f. velutipes**) observed chlamydospores (aleurospores) - 7x 12 µm thick walled - see Fig. 4

Hyphae dikaryotic, arthrospores originally monokaryotic, later observed numerous mitoses and arthrospores become dikaryotic (homokaryotic).

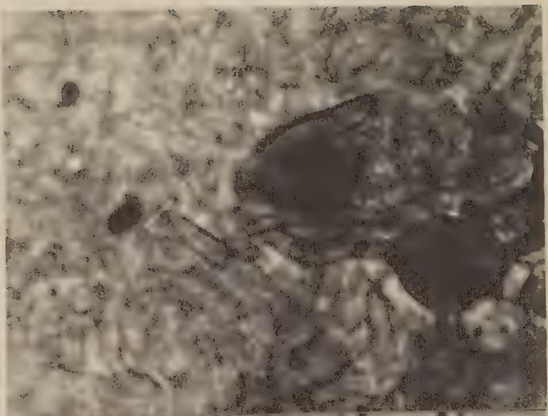

Fig. 2
Club-like terminal cells of hyphae of *Flammulina fennae*.

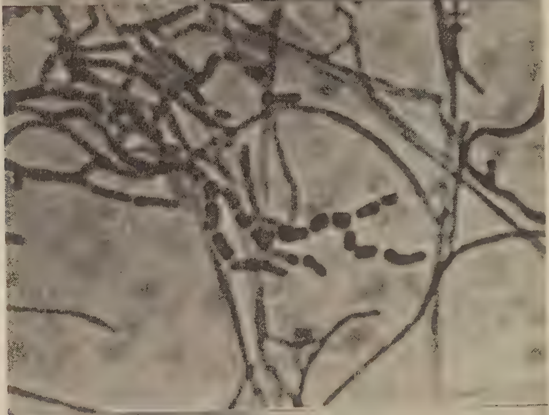

Fig. 3
Chain of arthrospores in *Flammulina velutipes*.

Fig. 4
Chlamydospores in *Flammulina velutipes*.

Table 1.
Enzyme activity of the species of the genus **Flammulina**

	F.fennae	F.ononidis	F.velutipes
laccase (syringaldazine)	++	-	-
(1-naphtol)	+	-	-
(guaiacol)	+	±	-
catalase	++	++	++
peroxidase	±	-	-
tyrosinase	-	-	-
lipase	+	++	+
lecithinase	-	-	-
amylase	++	++	++
cellulase	+	+	+
α -glucosidase	-	-	-
ß- galactosidase	-	+	+
gelatinase	+	++	++
milk peptidase	+	++	++
milk clotting enzymes	+	+	+
urease	-	-	-

Key for determination of species of the genus **Flammulina** according to morphological and biochemical characteristics of dikaryotic mycelial cultures

1a. laccase positive, the colour of the colony yellow, growth less than 3 mm/day ....F.fennae

1b. laccase negative, the colour of the colony white or yellowish white, growth faster 2

  2a. arthrospores present after 14 days cultivation, lipase very weak(after 10 days incubation), growth rate more than 6 mm/day ....F.velutipes

  2b. arthrospores present after 3 month cultivation, lipase present after 5 day incubation, growth slower F.ononidis

DISCUSSION AND CONCLUSIONS

Cultures of the genus **Flammulina** are characterized by good growth (2.5-8mm/day), by clamps, arthrospores, anastomoses, musty odour, high activity of amylase and catalase, by the presence of cellulases, lipases, proteolytic and milk clotting enzymes and by absence of tyrosinase, α-glucosidase and urease.

Contrary to Bas (1983) we observed arthrospores in F. **fennae** cultures. They could be detected only rarely, only after a longer (minimum 4 month) cultivation. A similar situation occurred in dikaryotic mycelia of F. **ononidis**; on the other hand, in monokaryotic mycelia arthrospores were observed already 10 days after germination of basidiospores. In **Flammulina velutipes** thick-walled aleurospores produced in several monosporic cultures of **F. velutipes var. velutipes f. velutipes** were detected in addition to common arthrospores. Such structures have not yet been described.

When summarizing the comparative study of morphological characters and enzyme activities of mycelial cultures of the genus **Flammulina**, we can conclude: cultures of the species F. **velutipes** and F. **ononidis** are morphologically very similar; no well defined feature was found. The only different characters are quantitative. Culture of F. **fennae** were quite different from the above mentioned couple (e.g. positive laccase, negative ß-galactosidase, slight production of proteases and cellulases, texture of mycelial mat, colour). Phenoloxidases unambiguously differentiate F. **fennae** from F. **velutipes** and F. **ononidis** couple. F. **fennae** contrary to F. **velutipes** and F. **ononidis** oxidizes not only syringaldazine (specific for laccase, E.C. 1.10.3.2. benzendiol:oxygen oxidoreductase, cf.Marr et al. 1986), but the results are the same using less specific agents as well (1-naphtol, guaiacol). Disability of F. **velutipes** to produce laccase is in agreement with observations of other authors (Käärik 1965, Nobles 1965, Bresinsky and Besl 1979, Marr 1979).

Although **Flammulina velutipes** and F. **ononidis** are very similar in the pure culture, negative interfertility tests support the existence of two different species. The interfertility tests between monokaryotic strains of **Flammulina velutipes** and F. **fennae** were negative (Bas 1983).

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LITERATURE CITED

Bas, C. 1983. Flammulina in Western Europe. Persoonia 12: 51-66.

Boidin, J. 1951. Recherche de la tyrosinase et de la laccase chez les Basidiomycète en culture pure. Milieux differentiels. Intéret systématique. Rev. Mycol.16: 173-234.

Bresinsky, A. and Besl,H. 1979. Zum verwandtschftlichen Anschluss von Omphalotus. Sydowia Beiheft 8:98-109.

Brodie, H.J. 1936. The occurence and function of oidia in the Hymenomycetes. Am.J. Botany 23:309-327.

Buchalo, A.S.,1988. Vysshiye siedobnyie bazidiomycety v chistoy kulture. Naukova dumka, Kiev.

Buchalo, A.S., Bilaj T.L. and Besarab, B.N. 1971. Proteolitichna aktivnist´ visshikh bazidiomycetiv. Microbiol. Zhurnal 33: 663-666.

Falck, R. 1902. Die Cultur der Oidien und ihre Rückführung in die höhere Fruchtform bei den Basidiomyceten. Beiträge zur Biologie der Pflanzen 8: 307-346.

Ingold, C.T. 1980a. Mycelium, oidia and sporophore initials in Flammulina velutipes. Trans. Brit. Mycol. Soc. 75:107-116.

Ingold, C.T. 1980b. Flammulina velutipes. Bull. Brit. Mycol. Soc. 14: 112-118.

Käärik, A. 1965. The identification of mycelia of wood-decay fungi by their oxidation reactions with phenolic compounds. Stud. Forest. Sues. 31: 1-61.

Kawai, M. and Mukai, N. 1970. Studies on milk clotting enzymes produces by Basidiomycetes. Part. I. Agr. Biol. Chem. 34: 159-163.

Klán, J., Baudišová, D. and Beneš, K. 1989. Cytochemical demonstration of enzymes in hyphae of mycelial cultures of macromycetes (Ascomycotina and Basidiomycotina): I. Esterases and glycosidases. Čes. Mykol. 43: 30-35.

Klán, J., Baudišová, D. and Rulfová, I., 1989. Cultural, enzymatic and cytological studies in the genus Pholiota. Mycotaxon 36: 249-271.

Klán, J. and Baudišová, D. 1990a. Enzyme activity of mycelial cultures of saprotrophic macromycetes (Basidiomycotina). I. Methods of hydrolases estimation. Čes. Mykol. 44: 203-211.

Klán, J. and Baudišová, D. 1990b. Enzyme activity of mycelial cultures of saprotrophic macromycetes (Basidiomycotina and Ascomycotina. II. Methods of oxidoreductases estimation. Čes. Mykol. 44: 212-219.

Koenigs, J.V. 1970. Peroxidase activity in brown-rot basidiomycetes. Arch. Microbiol. 73: 121-124.

Kornerup, A. and Wanscher, J.H. 1984. Methuen Handbook of Colour. London.

Lamoure, D. 1989a. Indices of useful informations for intercompatibility tests in Basidiomycetes. V. Agaricales sensu lato. Cryptogam. Mycol. 10: 41-80.

Lamoure, D. 1989b. Species concept in the Flammulina velutipes group. Opera Bot. 100: 163-168.

Lyr, H. 1958. Über den Nachweis von Oxydasen und Peroxydasen bei höheren Pilzen und die Badeutung dieser Enzyme für die Bavendamm Reaktion. Planta 50: 359-370.

Marr, C.D. 1979. Laccase and peroxidase oxidation of spot test reagents. Mycotaxon 9: 244-276.

Marr, C.D., Grund, D.W. and Harrison, K.A. 1986. The Taxonomic potential of laccase and tyrosinase spot test. Mycologia 78: 169-184.

Miller, O.K. Jr. 1971. The relationship of cultural characters to the taxonomy of a agarics. In: Petersen, R. (ed.) Evolution in the higher Fungi, pp. 197-215. Univ. of Tennessee, Knoxville.

Mišurcová, Z., Nerud, F. and Musílek, V. 1987. Screening of basidiomycetes for the production of milk-clotting enzymes. Čes. Mykol. 41: 50-53.

Nobles, M.K. 1948. Studies in forest pathology. VI. Identification of culture of wood-rotting fungi. Can. J. Bot. 26: 281-413.

Nobles, M.K. 1965. Identification of cultures of wood--inhabiting Hymenomycetes. Can. J. Bot. 43: 1097-1139.

Psurceva, H.V. 1987. Kultura Flammulina velutipes (Fr.)P. Karst. (biologija, narodochozjajstvennoe znachenije). Mikol. Filopat. 21: 477-486.

Semerdžieva, M. 1965. Pěstování a morfologická pozorování některých hub čeledi Agaricaceae in vitro. Čes. Mykol. 19: 230-239.

Takemaru, T. 1961. Genetical studies on fungi. X. The mating system in hymenomycetes and its genetical mechanism. Biol. J. Okayama Univ. 7: 133-211.

Van Tieghem, M.Ph. 1876. Nouvelles observations sur le développement du fruit et sur la prétendue sexualité des Basidiomycètes et des Ascomycètes. Bull. Soc. Bot. Fr. 23: 99-105.

Watling, R. 1983. How to identify mushroom to genus. V. Cultural and developmental features. Eureka.

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PORE FUNGI OF COSTA RICA. II[1]

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This paper represents the second part of the list of Costa Rican Pore Fungi, and includes members of the Hymenochaetaceae and Polyporaceae not included on the previous paper (Carranza-Morse, 1991).

Costa Rica has a very diverse flora and fauna, and many studies have been carried on dealing with higher plants and animals, but the mycoflora have not been studied as extensively. Serious problems of deforestation are affecting Costa Rica, and together with the higher plants, the fungi are disappearing from the forests. It has become imperative to have a current list of the fungi in order to maintain a record of the fungal diversity present in this tropical environment.

The specimens listed are deposited in the Herbarium of the School of Biology, University of Costa Rica (USJ), in the Herbarium of the USDA at Beltsville, Maryland (BPI), in the Herbarium of the National Museum, Costa Rica (CR), or cited by other authors (Covington, 1980; Larsen and Cobb Poulle, 1990; Lowe, 1963; 1966; 1976; Murrill, 1915).

Materials and Methods

Free hand sections were prepared from each specimen and mounted in 3% KOH to which a drop of aqueous phloxine was added, and in Melzer's reagent. Observations were done under a light microscope.

The species are listed in alphabetical order according to specific epithet in each genus. Herbarium abbreviations are from Holmgren et al. (1981). Species preceded by an asterisk (*) are new records for the country.

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Phellinus allardii (Bres.) Ahmad, Monogr. Biol. Soc. Pakistan 6:57. 1972.
Fomes allardii Bres., Bull. Jard. Bot. Bruxelles 4: 19. 1910.

Comments: Basidiospores 3.0-5.0 x 2.0-4.0 um, slightly smaller than reported by Ryvarden & Johansen (1980), and Larsen & Cobb Poulle (1990).
Voucher specimens examined: Monteverde, Puntarenas, JCM 60-80 (USJ 21283); Ciudad Colón, San José, JCM 158-79 (USJ21506); Turrialba, Cartago, JCM 10-81 (USJ 21282). (Altitudinal distribution: 640-1330 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: Central America; Africa; Pakistan.

***Phellinus calcitratus** (Berk. & Curt.) Ryv., Norw. J. Bot. 19:234. 1972.
Polyporus calcitratus Berk. & Curt., J. Linn. Soc. Bot. 10: 314. 1868.

Voucher specimen examined: Parque Nac. Rincón de la Vieja, Guanacaste, R. Alfaro 41 (USJ 22981). (Altitudinal distribution: 800-1200 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: Central and South America; Caribbean Islands.

***Phellinus chryseus** (Lev.) Ryv., Prelim. Polyp. Fl. East Africa, p. 151. 1980.
Polyporus chryseus Lev., Ann. Sci. Nat. Ser. 3, Vol. 5: 133. 1846.

Voucher specimen examined: Nubes de Coronado, San José, JCM 226-87 (USJ 28228). (Altitudinal distribution: 1510 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: Central and South America; Africa.

Phellinus depends (Murr.) Imaz., Bull. Gov. Forest Exp. Sta. 57:117. 1952.
Pyropolyporus depends Murr., North Amer. Flora 9:106. 1908.

Comments: One specimen at BPI. No duplicates at USJ.
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: North, Central and South America; West Indies.

***Phellinus extensus** (Lev.) Pat., Essai Tax. p. 97. 1900.
Polyporus extensus Lev., Ann. Sci. Nat. Bot. III 5: 129. 1846.

Comments: Basidiospores 3.0-4.0 x 2.0-3.0 um; smaller than reported by Ryvarden & Johansen (1980) and Larsen & Cobb Poulle (1990).
Voucher specimen examined: Agua Caliente, San Carlos, Alajuela, JCM 234-80 (USJ 27908). (Altitudinal distribution: 350 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: North, Central and South America; Africa; Asia.

Phellinus fastuosus (Lev.) Ryv., Norw. J. Bot. 19 (3-4): 234. 1972.
Polyporus fastuosus Lev., Ann. Sci. Nat. Ser. 3. Vol. 2: 1844.

Voucher specimen examined: Jardín, Santa Ma. de Dota, San José, J.L. Lowe 13411 (USJ 9835); Monteverde, Puntarenas, JCM 144-87 (USJ 28023). (Altitudinal distribution: 1330-1800 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: North, Central and South America; Africa; Australia; Asia.

***Phellinus flavomarginatus** (Murr.) Ryv., Norw. J. Bot. 19 (3-4):234. 1972.
Fomitiporia flavomarginata Murr., North Amer. Flora 9: 11. 1907. **Phellinus ferrugineo-velutinus** (Henn.) Ryv., Norw. J. Bot. 19 (3-4):234. 1972.

Comments: Basidiospores 3.5-5.0 x 2.5 um; larger than reported by Ryvarden & Johansen (1980), and Larsen & Cobb Poulle (1990).
Voucher specimen examined: Santa Ma. de Dota, San José, JCM 104-87 (USJ 27939). (Altitudinal distribution: 2300 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: North, Central and South America.

Phellinus gilvus (Schw. : Fr.) Pat., Ess. Tax. Hym. p. 97. 1900.
Polyporus gilvus Schw.: Fr., Elench. Fung. 1:104. 1828.

Comments: A more detailed description is given by Carranza & Saenz (1984).

Phellinus griseoporus Reid, Mem. New York Bot. Gard. 28:192. 1976.

Voucher specimen examined: Costa Rica, collector unknown, USJ 21187.
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: Central America.

Phellinus linteus (Berk. & Curt.) Teng., Fungi of China p. 467. 1964.
Polyporus linteus Berk. & Curt., Proc. Amer. Acad. Arts (Boston) 4:122. 1860.

Voucher specimens examined: Atenas, Alajuela, JCM 22-85 (USJ 22296); Alto de las Palomas, Santa Ana, San José, JCM 31-86 (USJ 22275); Sendero Penca, Palo Verde, Guanacaste, JCM 12-88 (USJ 27906) (Altitudinal distribution: 80-904 m).
Type of rot: White pocket rot.
Substrata: On hardwood trees (**Pithecellobium dulce** (Roxeh.) Benth.; **Luehea** sp.; **Tabebuia ochracea** (Cham.) Standley subsp. **neochrysantha** (A. Gentry) A. Gentry.
Distribution: North, Central and South America; Africa; Asia.

Phellinus maxonii (Murr.) Reid, Kew Bull. 35:867. 1981.
Fomitiporia maxonii Murr., North Amer. Flora 9:11. 1907.

Comments: Listed by Larsen & Cobb Poulle (1990). No duplicates at USJ.

***Phellinus melleoporus** (Murr.) Ryv., Mycotaxon 23:177. 1985.
Fomitiporella melleopora Murr., North Am. Flora 9: 13. 1907.

Voucher specimens examined: Alto de las Palomas, Santa Ana, San José, JCM 23-86 (USJ 22818); Monte de la Cruz, Heredia, L. D. Gomez 24204 (USJ 22799) (Altitudinal distribution: 900-1700 M).
Type of rot: White rot.
Substrata: On hardwood trees (**Inga** sp.).
Distribution: North, Central and South America.

***Phellinus merrillii** (Murr.) Ryv., Norw. J. Bot. 19 (3-4):234. 1972.
Pyropolyporus merrillii Murr., Bull. Torr. Bot. Cl. 34: 479. 1907.

Comments: Basidiospores 4.0-5.0 x 3.5-4.0 um, smaller than reported by Ryvarden & Johansen (1980) and Larsen & Cobb Poulle (1990).
Voucher specimens examined: Alto de Lagunilla, Santa Cruz, Guanacaste, JCM 132-86 (USJ 27914); Costa Rica, collector

unknown, USJ 21205. (Altitudinal distribution: 49 m).
Type of rot: White rot.
Substrata: On hardwood (**Cassia espectabilis** DC.) and softwood trees.
Distribution: North and Central America; Africa; Philippines; Caribbean Islands.

***Phellinus nilgheriensis** (Mont.) Cunn., New Zealand Dept. Sci. Ind. Res. Bull. 164:26. 1965.
Phellinus pseudosenex (Murr.) Herr. et Bond., Mikol. Fitopatol. 14:9. 1980. **Fomes pseudosenex** (Murr.) Sacc. & Trott., Syll. Fung. 21:292. 1912.

Voucher specimen examined: Tilarán, Guanacaste, JCM 304-80 (USJ 22281). (Altitudinal distribution: 564 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: North, Central and South America; Africa; Asia; Caribbean Islands.

Phellinus noxius (Corner) Cunn., N. Zeal. Dep. Sci. Ind. Res. Bull. 164:221. 1965.
Fomes noxius Corner, Gard. Bull. Straits Settlem. 5(12): 324. 1932.

Voucher specimens examined: Costa Rica, Siggers USJ 21207; Puerto Viejo, Sarapiquí, Heredia, J.L. Lowe 13296 (USJ 9837). (Altitudinal distribution: 37 m).
Type of rot: White rot.
Substrata: On hardwood and softwood trees.
Distribution: Central and South America; Africa; Caribbean Islands; Asia; Australia.

Phellinus pectinatus (Kl.) Quél., Enrich. Fung. p. 173. 1886.
Polyporus pectinatus Kl., Linnaea 8: 485. 1833.

Comments: Basidiospores 3.0-5.0 x 3.0-4.0 um, larger than reported by Ryvarden & Johansen (1980), and Larsen & Cobb Poulle (1990).
Voucher specimen examined: Reserva Carara, Puntarenas, JCM 83-87 (USJ 27537); 6 Km Volcán Irazú, Cartago, JCM 97-87 (USJ 27907); Reserva Carara, Puntarenas, JCM 250-86 (USJ 27940). (Altitudinal distribution: 120-2200 m).
Type of rot: White rot.
Substrata: On hardwood trees (**Quercus** sp.).
Distribution: Central and South America; Africa; Caribbean Islands.

Phellinus portoricensis (Overh.) Fidalgo, Mem. New York Bot. Gard. 17, no. 2:111. 1968.
Fomes portoricensis Overh. in Seaver and Chardon, Sci. Surv. Porto Rico & Virgin Islands. 8:158. 1926.

Comments: Basidiospores 4.0 x 2.0 um, smaller than reported by Ryvarden & Johansen (1980), but similar size than reported by Larsen and Cobb Poulle (1990).
Voucher specimens examined: Pavones, Cartago, JCM 84-80 (USJ 21255); Cerro de la Muerte, San José, A.L. Welden, TU 7025 (USJ 21217). (Altitudinal distribution: 800-3000 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: North, Central and South America; Africa; Caribbean Islands.

Phellinus punctatus (Fr.) Pilat, Atl. Champ. Europe 3: 530. 1942.
Polyporus punctatus Fr., Hym. Eur. p. 572. 1874.

Voucher specimen examined: Montaña de la Cruz, Escazú, San José, A. L. Welden TU 8581 (USJ 27671). (Altitudinal distribution: 900 m).
Type of rot: Uniform white rot.
Substrata: On hardwood and softwood trees.
Distribution: North , Central and South America; Africa; Europe; Australia; New Zealand; Caribbean Islands.

Phellinus rimosus (Berk.) Pil., Ann. Mycol 38: 80. 1940.
Polyporus rimosus Berk., Lond. J. Bot. 4: 54. 1845.

Comments: Basidiospores 6.5 x 3.5-5.0 um; smaller than reported by Larsen & Cobb Poulle (1990).
Voucher specimen examined: Finca El Rodeo, Universidad para la Paz, Ciudad Colón, San José, JCM 115-87 (USJ 27527). (Altitudinal distribution: 800 m).
Type of rot: White rot.
Substrata: On hardwood trees (Fabaceae: **Gliricidia sepium** (Jacquin.) Stend.).
Distribution: Central and South America; Africa; Europe; Asia; Australia.

***Phellinus robustus** (Karst.) Bourd. & Galz., Bull. Soc. Mycol. France 41:188. 1925.
Fomes robustus Karst., Krit. Overs. Finl. Basidsv. p. 467. 1889.

Comments: Basidiospores 5.0-6.0 um diameter, smaller than reported by Ryvarden & Johansen (1980), and Larsen & Cobb Poulle (1990).
Voucher specimen examined: Finca Tres Amigos, San Carlos, Alajuela, R.C. Lorenz (USJ 21176). (Altitudinal distribution: 700 m).
Type of rot: White rot.
Substrata: On hardwood and softwood trees.
Distribution: North , Central and South America; Africa; Europe; Asia; Australia; Caribbean Islands.

Phellinus roseo-cinereus (Murr.) Reid, Mem. New York Bot. Gard. 28:194. 1976.
Pyropolyporus roseo-cinereus Murr., North Am. Fl. 9:104. 1908.

Comments: Listed by Lowe (1957) and by Murrill (1915). No duplicates at USJ.
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: Central and South America; Caribbean Islands.

Phellinus rufi-tinctus (Berk. & Curt. ex Cke.) Ryv., Norw. J. Bot. 19 (3-4) 235. 1972.
Polyporus rufi-tinctus Berk. & Curt. ex Cke., Grevillea 15: 25. 1886.

Comments: Listed by Lowe (1966). No duplicates at USJ.
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: North and Central America; Africa; Caribbean Islands.

***Phellinus sancti-georgii** (Pat.) Ryv., Norw. J. Bot. 19: 235. 1972.
Polyporus sancti-georgii Pat., Bull. Soc. Mycol. Fr. 14: 207. 1895.

Comments: Basidiospores 4.0-5.0 x 2.5-4.5 um.
Voucher specimens examined: Sendero Nuboso, Monteverde, Puntarenas, JCM 157-87 (USJ 28212); Monteverde, Puntarenas, JCM 26-80 (USJ 27952). (Altitudinal distribution: 1330 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: Central and South America; Asia; Africa; Caribbean Islands.

Phellinus sarcitus (Fr.) Ryv., Norw. J. Bot. 19:235. 1972.
Polyporus sarcitus Fr., Nova Acta Reg. Soc. Sci. Uppsal. Ser. 3, Vol. 1:66. 1851.

Comments: Basidiospores 4.0-6.0 x 2.0-3.0 um; larger than reported by Ryvarden and Johansen (1980).
Voucher specimens examined: Irazú Volcano, Cartago, JCM 202-80 (USJ 21247); Ojo de Agua, Santa Ma. de Dota, San José, JCM 130-79 (USJ 21256); Carretera Interamericana, Km 71, San José, JCM 279-80 (USJ 21248). (Altitudinal distribution: 1400-3000 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: North, Central and South America; Africa; Caribbean Islands.

Phellinus setulosus (Lloyd) Imaz., Bull. Tokyo Sci. Mus. 6:104. 1943.
Fomes setulosus Lloyd, Mycol. Writ. 4:243. 1915.

Comments: Basidiospores 4.5-7.0 x 3.5-5.0 um; smaller than reported by Ryvarden & Johansen (1980), and Larsen & Cobb Poulle (1990).
Voucher specimen examined: Cartago, collector unknown, USJ 21235. (Altitudinal distribution: 1400 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: Central America; Africa; Asia; New Zealand; Australia; Tasmania.

Phellinus sweiteniae (Murr.) Herr. et Bond., in Bond. et Herr., Mikol. Fitopatol. 14:9. 1980.
Fomes sweiteniae (Murr.) Rick , Broteria (ser. Bot.) 21, fasc. 1: 7 (or 30). 1924.

Comments: Listed by Lowe (1957). No duplicates at USJ. Only one collection done by Dodge and Thomas (6726) in 1930, and deposited at BPI (234980).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: North, Central and South America; Caribbean Islands.

Phellinus tropicalis M. Larsen & Lombard, Mycologia 80: 73. 1988.
Poria rickii Bres., Ann. Mycol. 18:37. 1920 (non **Phellinus rickii** Teixeira, 1950).

Voucher specimens examined: Jardín, Santa Ma. de Dota, San José, J.L. Lowe 13392 (USJ 9804); Tacares, Heredia, J.L. Lowe 13465 (USJ 9805). (Altitudinal distribution: 600-2300 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: Central and South America.

Phellinus umbrinellus (Bres.) Herr. et Bond., Mikol. Fitopatol. 14:8. 1980.
Poria umbrinella Bres., Hedwigia 35:282. 1896.

Voucher specimen examined: Jardín, Santa Ma. de Dota, San José, J.L. Lowe 13390 (USJ 9807). (Altitudinal distribution: 1850 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: North, Central and South America; Africa; Caribbean Islands; New Zealand.

***Phellinus undulatus** (Murr.) Ryv., Norw. J. Bot. 19:235. 1972.
Fomitiporia undulata Murr., North Am. Fl. 9:10. 1907.

Comments: Basidiospores 3.0-4.0 x 3.0 um; smaller than the ones reported by Ryvarden & Johansen (1980), but similar size to the ones reported by Larsen & Cobb Poulle (1990).
Voucher specimens examined: La Selva, Sarapiquí, Heredia, JCM 158-86 (USJ 27942); Santa Ma. de Dota, San José, JCM 38-88 (USJ 28037). (Altitudinal distribution: 37-1853 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: Central and South America; Africa.

***Phylloporia capucina** (Mont.) Ryv., Nordic J. Bot. 2:77. 1982.
Polyporus capucinus Mont., Ann. Sci. Nat. Ser. 4, Vol. 5:369. 1857.

Comments: One specimen deposited at BPI. No duplicates at USJ.

***Phylloporia chrysita** (Berk.) Ryv., Norw. J. Bot. 19: 235. 1972.
Polyporus chrysites Berk., Hooker's J. Bot. 8: 233. 1856.

Comments: Basidiospores 2.0-4.5 x 2.5-3.0 um; larger than reported by Ryvarden & Johansen (1980).
Voucher specimens examined: Monteverde, Puntarenas, JCM 176-86 (USJ 22754); Carara Reserve, Puntarenas, JCM 82-87 (USJ 27531); Finca El Rodeo, Ciudad Colón, San José, JCM 295-80 (USJ 22784); 4 Km Estación Recope, Carretera Interamericana Norte, bosque de galería, Guanacaste, JCM 17-91 (USJ 33443). (Altitudinal distribution: 100-1330 m).
Type of rot: White rot.
Substrata: On living hardwood trees (**Erythrochiton gymnanthus** Kallunki).
Distribution: North, Central and South America; Africa; Asia; Caribbean Islands.

Phylloporia frutica (Berk. & Curt.) Ryv., Norw. J.Bot. 19: 235. 1972.
Polyporus fruticum Berk. & Curt., J. Linn. Soc. Bot. 10: 310. 1868.

Comments: A more detailed description is given by Carranza & Saenz (1984).
Type of rot: White rot.
Substrata: On living hardwood trees.
Distribution: North, Central and South America; Africa; Caribbean Islands.

Laetiporus sulphureus (Fr.) Murr., Mycologia 12:11. 1920.
Polyporus sulphureus Fr., Syst. Mycol. 1:357. 1821.

Voucher specimens examined: San Pablo, Turrialba, Cartago, JCM 125-87 (USJ 27554); Monteverde, Puntarenas, M. Campos, JCM 175-86 (USJ 22823); Ciudad Universitaria, San Pedro, San José, JCM 191-86 (USJ 22705); cerca Volcán Barva, L. Umaña & S. Gruber (USJ 28115). (Altitudinal distribution: 600-2300 m).
Type of rot: Brown rot.
Substrata: On living hardwood (**Eucalyptus** sp.; **Quercus** sp.) and softwood trees.
Distribution: Cosmopolitan.

Lenzites betulina (Fr.) Fr., Epicr. p. 405. 1838.
Daedalea betulina Fr., Syst. Mycol. 1:333. 1821.

Comments: Listed by Covington (1980). No duplicates at USJ.

***Lenzites stereoides** (Fr.) Ryv., Norw. J. Bot. 19 (3-4): 232. 1972.
Daedalea stereoides Fr., Nova Acta Reg. Soc. Sci. Upps. Ser. III. 1:99. 1851.

Voucher specimens examined: Monteverde, Puntarenas, JCM 146-87 (USJ 27550); Monteverde, Puntarenas, JCM 40-80 (USJ 22284). (Altitudinal distribution: 1300-1500 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: Central America; Africa.

Lindtneria trachyspora (Bourd. & Galz.) Pilat, Studia Bot. Cech. 1:72. 1938.
Poria trachyspora Bourd. & Galz., Hym. France, p. 659. 1928.

Voucher specimen examined: Sardinal, Guanacaste, J.L. Lowe 13194 (USJ 9799). (Altitudinal distribution: 120 m).
Type of rot: White rot.
Substrata: On hardwood and softwood trees.
Distribution: North and Central America; Europe.

***Loweporus inflexibilis** (Berk.) Ryv., Prelim. Polyp. Fl. East Africa, p. 413. 1980.
Polyporus inflexibilis Berk., Hook. J. Bot. 8:199. 1856.

Voucher specimens examined: San Carlos, Alajuela, USJ 21285; Cartago, USJ 21190. (Altitudinal distribution: 600-1400 m).

Type of rot: Brown rot (?).
Substrata: On hardwood trees.
Distribution: Central and South America; Africa; Caribbean Islands; Madagascar; Malasia; Tanzania.

Loweporus roseo-albus (Jungh.) Ryv., Prelim. Polyp. Fl. East Africa, p. 415. 1980.
Polyporus roseo-albus Jungh., Verh. Batav., Genootsch. 17: 43. 1838.

Voucher specimens examined: Sendero del río, Monteverde, Puntarenas, JCM 64-87 (USJ 28270); Santa Ma. de Dota, San José, JCM 229-87 (USJ 28234); Monteverde, Puntarenas, JCM 145-87 (USJ 28231); Limón, Limón, USJ 21237. (Altitudinal distribution: 5 - 1800 m).
Type of rot: Brown rot (?).
Substrata: On hardwood trees.
Distribution: Central and South America; Africa.

***Megasporoporia cavernulosa** (Berk. & Curt.) Ryv., Mycotaxon 16:174. 1982.
Polyporus cavernulosus Berk., Hook. J. Bot. 8:235. 1856.

Voucher specimen examined: La Uruca, Santa Ana, San José, L.D. Gomez 24171 (USJ 22812). (Altitudinal distribution: 900 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: North and Central America; Africa.

***Megasporoporia setulosa** (Henn.) Rajch., Mycotaxon 16: 172-182. 1982.
Poria setulosa Henn., Engl. Bot. Jahrb. 28:321. 1901.

Comments: Only one collection reported by Danielson and deposited and BPI (249432). No duplicates at USJ.
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: Central and South America; Africa. Pantropical.

***Microporellus dealbatus** (Berk. & Curt.) Murr., Bull. Torrey Bot. Club 32:483. 1905.
Polyporus dealbatus Berk. & Curt., Ann. Mag. Nat. Hist. Ser. 2, 12:432. 1853.

Voucher specimen examined: Nicoya, Guanacaste, JCM 122-86 (USJ 22760). (Altitudinal distribution: 100 m).
Type of rot: White rot.
Substrata: On ground from buried roots of hardwood trees.
Distribution: North, Central and South America.

Microporellus holothephrus (Berk. & Curt.) Murr., Bull. Torrey Bot. Club 32. 1905.

Comments: A more detailed description is given by Carranza & Saenz (1984).

Microporellus obovatus (Jungh.) Ryv., Norw. J. Bot. 19 (3-4):232. 1972.
Polyporus obovatus Jungh., Verh. Batav. Genootsch 17:65. 1839.

Comments: A more detailed description is given by Carranza & Saenz (1984).

***Nigrofomes melanoporus** (Mont.) Murr., Bull. Torr. Bot. Club 31:425. 1904.
Polyporus melanoporus Mont., Ann. Sci. Nat. Ser. 2, 17: 127. 1842.

Voucher specimens examined: El Empalme, San José, J.L. Lowe 13478 (USJ 9836); La Selva, Puerto Viejo, Sarapiquí, Heredia, C.L. Ovrebo 2776 (USJ 28163); Monteverde, Puntarenas, JCM 46-87 (USJ 27948). (Altitudinal distribution: 37-2300 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: North, Central and South America; Africa.

Nigroporus vinosus (Berk.) Murr., Bull. Torr. Bot. Cl. 32:361. 1905.

Comments: A more detailed description is given by Carranza & Saenz (1984).

***Oxyporus latemarginatus** (Dur. & Mont. ex Mont.) Donk, Persoonia 4:342. 1966.
Polyporus latemarginatus Dur. & Mont., Syll. Crypt. p. 163. 1856.

Voucher specimens examined: Alajuela, Alajuela, J.L. Lowe 13358 (USJ 9775); Jardín , Santa Ma. de Dota, San José, J.L. Lowe 13409 (USJ 9776); Uvita, Heredia, J.L. Lowe 13379 (USJ 21981). (Altitudinal distribution: 30-2200 m).
Type of rot: White rot.
Substrata: On hardwood and softwood trees.
Distribution: North, Central and South America; Africa; Caribbean Islands.

***Perenniporia martius** (Berk.) Ryv., Norw. J. Bot. 19:143. 1972.
Polyporus martius Berk., Hook. J. Bot. 8:198. 1856.

Voucher specimen examined: San Miguel, Puriscal, San José, L. Umaña, JCM 1-91 (USJ 33126).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: Central America; Africa.

***Perenniporia medulla-panis** (Jacq. : Fr.) Donk, Persoonia 5(1):76. 1967.
Polyporus medulla-panis Jacq. : Fr., Syst. Mycol. I: 280. 1821.

Voucher specimen examined: Finca El Rodeo, Ciudad Colón, San José, JCM 66-86 (USJ 22756); 4 Km Estación Recope, Carretera Interamericana Norte, bosque de galería, Guanacaste, JCM 14-91 (USJ 33284). (Altitudinal distribution: 100 - 800 m).
Type of rot. White rot.
Substrata: On hardwood and softwood trees.
Distribution: North, Central and South America; Africa.

***Perenniporia ochroleuca** (Berk.) Ryv., Norw. J. Bot. 19(3-4): 233. 1972.
Polyporus ochroleucus Berk., Hook. Lond. J. Bot.4:53. 1845.

Voucher specimen examined: Heredia, Heredia, L.D. Gomez 24359 (USJ 22905). (Altitudinal distribution: 1150 m).
Type of rot: White rot.
Substrata: On hardwood and softwood trees.
Distribution: Cosmopolitan.

***Perenniporia ohiensis** (Berk.) Ryv., Norw. J. Bot. 19: 143. 1972.
Trametes ohiensis Berk., Grevillea 1:66. 1872.

Voucher specimen examined: Uvita, Heredia, J.L. Lowe 13123 (USJ 9834). (Altitudinal distribution: 600 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: North, Central and South America; Caribbean Islands.

***Perenniporia subacida** (Peck) Donk, Persoonia 5:76. 1967.
Polyporus subacidus Peck, Rept. N.Y. St. Mus. 38:92. 1885.

Voucher specimens examined: Jardín, Santa Ma. de Dota, San José, JCM 195-79 (USJ 22028). (Altitudinal distribution: 2200 m).
Type of rot: White stringy rot.
Substrata: On hardwood and softwood trees.
Distribution: North and Central America; Africa.

Perenniporia tepeitensis (Murr.) Ryv., Mycotaxon 23:174. 1985.
Coriolus tepeitensis Murr., Bull. New York Bot. Gard. 8:142. 1912.

Voucher specimen examined: Cartago, collector unknown, USJ 21112. (Altitudinal distribution: 1400 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: North and Central America.

***Perenniporia tephropora** (Mont.) Ryv., Norw. J. Bot. 19:233. 1972.
Polyporus tephroporus Mont., Ann. Sci. Nat. Ser. 3 Vol. 4: 358. 1845.

Comments: Basidiospores 7.5 x 3.5 um; larger than reported by Ryvarden & Johansen (1980).
Voucher specimen examined: San Pedro, San José, JCM 30-80 (USJ 28059); South slope of Irazú Volcano, Cartago, R.W. Holm and H.H. Iltis 1550 (USJ 21200); Turrialba, Cartago, JCM 33-79 (USJ 21271). (Altitudinal distribution: 1205-2196 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: North, Central and South America; Africa; Asia; Australia.

***Piptoporus soloniensis** (Dub. : Fr.) Pil., Atl. Champ. Europe 2:126. 1937.
Polyporus soloniensis Dub. : Fr., Syst. Mycol. 1:365. 1821.

Voucher specimen examined: San Cristóbal Sur, Cartago, L.D. Gomez 22856 (USJ 22815). (Altitudinal distribution: 1800 m).
Type of rot: Brown rot.
Substrata: On hardwood trees.
Distribution: North and Central America.

Polyporus arcularius Fr., Syst. Mycol. 1:342. 1821.

Comments: A more detailed description is given by Carranza & Saenz (1984).

Polyporus badius (S.F. Gray) Schw., Trans. Am. Phil. Soc. II 4:155. 1832.
Polyporus picipes Fr., Epicr. Syst. Mycol. p.440. 1838.

Comments: A more detailed description is given by Carranza & Saenz (1984).

Polyporus blanchetianus Berk. & Mont., Ann. Sci. Nat. Ser. 3, Vol. 11:238. 1849.

Polyporus nephridis Berk., Hook. J. Bot. 8:195. 1856.

Comments: A more detailed description is given by Carranza & Saenz (1984).

Polyporus brumalis Pers. : Fr., Syst. Myc. 1:348. 1821.

Comments: A more detailed description is given by Carranza & Saenz (1984).

***Polyporus ciliatus** Fr., Syst. Mycol. 1:349. 1821.

Voucher specimen examined: San Ramón, Alajuela, L.D. Gomez 24295 (USJ 22810). (Altitudinal distribution: 1000 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: Central America; Europe.

Polyporus diabolicus Berk., Hook. Lond. J. Bot. 8:174. 1856.
Polyporus vernicosus Berk., ibid. 175. 1856.

Comments: A more detailed description is given by Carranza & Saenz (1984).

***Polyporus dictyopus** Mont., Ann. Sci. Nat. II, 3:349. 1835.

Voucher specimen examined: Bosque Río de La Hoja, Heredia, A. Ruiz, G. Nuñez & O. Pearson, JCM 116-86 (USJ 27873). (Altitudinal distribution: 1120 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: Central and South America; Africa.

Polyporus guianensis Mont., Ann. Sci. Nat. Bot. Ser. 2, Vol. 13:201. 1840.
Polyporus wrightii Murr., N. Am. Fl. 9:61. 1907.

Comments: A more detailed description is given by Carranza & Saenz (1984).

Polyporus impolitus Fr., Nova Symb. p.58. 1851.

Comments: Type lost. Reported from Punta Arenas. Leg. G. Orsted (Ryvarden, pers. commun., 1991). Listed by Covington (1980). No duplicates at USJ.

Polyporus leprieruii Mont., Ann. Sci. Nat. Bot. Ser. 2, 13:203. 1840.
Polyporus subelegans Murr., N. Am. Fl. 9:62. 1907.

Voucher specimens examined: Parque La Amistad, San Vito, Coto Brus, JCM 124-87 (USJ 27862); La Selva, Sarapiquí, Heredia, C. Ovrebo 2275 (USJ 22968); Santa Rosa, Orotina, M. Campos (JCM 29-88, USJ 28191).
(Altitudinal distribution: sea level-1000 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: Central and South America; Africa; Caribbean Islands.

Polyporus maculosus Murr., Torrey Bot. Club Bull. 31:41. 1904.

Comments: A more detailed description is given by Carranza & Saenz (1984).

***Polyporus moluccensis** (Mont.) Ryv., Mycotaxon 38:84. 1990.
Favolus multiplex Lev., Ann. Sci. Nat. Ser. 3. Vol. 2:203. 1844.

Comments: Basidiospores 6.0-7.0 x 2.0-3.0 um.
Voucher specimen examined: Santa Ma. de Dota, San José, JCM 103-87 (USJ 27526). (Altitudinal distribution: 2300 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: Central America; Africa.

Polyporus subzonalis Cke., Grevillea 19:44. 1890.

Comments: A more detailed description is given by Carranza & Saenz (1984).

Polyporus tenuiculus (Beauv.) Fr., Syst. Mycol. 1:344. 1821.
Favolus brasiliensis (Fr.) Fr., Elench. Fung. 1:44. 1828.

Voucher specimens examined: Vara Blanca, Heredia, J.L. Lowe 13028 (USJ 21147); La Selva, Puerto Viejo, Sarapiquí, Heredia, A.L. Welden, TU 9072 (USJ 21148). (Altitudinal distribution: 37-1804 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: North and Central America.

Polyporus tricholoma Mont., Ann. Sci. Nat. Ser. 2, Vol. 8:365. 1837.
Polyporus raphanipes Wakef., Bull. Misc. Inf. Kew 1914:157. 1914.

Comments: A more detailed description is given by Carranza & Saenz (1984).

***Polyporus udus** Jungh., Tidschr. v. Nat. Gesch. Phys. 7:289. 1840.
Polyporus maculatus Berk., Hook. J. Bot. 3:80. 1848.

Voucher specimens examined: Monteverde, Puntarenas, R. Alfaro & L. D. Gomez 24857 (USJ 27636); Ciudad Universitaria Rodrigo Facio, San Pedro, San José, M. Boza, JCM 245-86 (USJ 22786). (Altitudinal distribution: 900-1500 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: Central America; Africa.

Polyporus varius Fr., Syst. Mycol. 1:352. 1821.

Voucher specimens examined: Palo Verde, Guanacaste, G. Herrera, JCM 13-79 (USJ 21388); Cañas, Guanacaste, J. A. Saenz, JCM 122-79 (USJ 21503). (Altitudinal distribution: 86-200 m).
Type of rot: White rot.
Substrata: On hardwood and softwood trees.
Distribution: North and Central America; Europe.

Polyporus virgatus Berk. & Curt., Jour. Linn. Soc. Bot. 10:304. 1868.

Comments: A more detailed description is given by Carranza & Saenz (1984).

***Porogramme albocincta** (Cke. & Massee) Lowe, Lloydia 21:102. 1958.
Poria albocincta Cke. & Massee, Grevillea 20:106. 1892.

Voucher specimens examined: La Selva, Sarapiquí, Heredia, C. Ovrebo 2255 (USJ 22980); La Virgen, Heredia, J.L.Lowe 13450 (USJ 9752); Monteverde, Puntarenas, JCM 42-87 (USJ 22938); El Empalme, San José, J.L. Lowe 13347 (USJ 22024); Turrialba, Cartago, J.L.Lowe 13312 (USJ 9754). (Altitudinal distribution: 37-2100 m).
Type of rot: White rot (?).
Substrata: On hardwood trees.
Distribution: North and Central America; Africa; Caribbean Islands.

Porogramme graphica (Bres.) Pat., Essai Tax., p.64. 1900.
Poria graphica Bres., Hedwigia 35:282. 1896.

Voucher specimens examined: Sendero Ochomogo, Monteverde, JCM 210-87 (USJ 27964); Río Claro, San José, J.L. Lowe 12825 (USJ 9759); Uvita, Heredia, J.L. Lowe 13257 (USJ 9755); Reserva Carara, Puntarenas, JCM 90-87 (USJ 22959). (Altitudinal distribution: 120-2000 m).
Type of rot: White rot (?).
Substrata: On hardwood trees.

Distribution: Central and South America; Caribbean Islands.

***Pseudofavolus cucullatus** (Mont.) Pat., Essai Tax. Hym. 1900.
Favolus cucullatus Mont., Ann. Sci. Nat. Ser. 2 Vol. 17: 125. 1842.

Voucher specimen examined: San Ramón, Alajuela, L.D. Gomez 24283 (USJ 22875). (Altitudinal distribution: 1000 m).
Type of rot: White rot.
Substrata: On hardwood trees.
Distribution: North and Central America; Africa.

Pycnoporus sanguineus (L.: Fr.) Murr., Bull. Torrey Bot. Club 31:421. 1904.
Polyporus sanguineus L.: Fr., Syst. Mycol. 1:371. 1821.

Comments: A more detailed description is given by Carranza & Saenz (1984).

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LITERATURE CITED

CARRANZA, J. & J.A. SAENZ. 1984. Wood decay fungi of Costa Rica. Mycotaxon 29:151-166. CARRANZA-MORSE, J. 1991. Pore fungi of Costa Rica. Mycotaxon 41: 345-370. COVINGTON, D.J. 1980. Fungi Costaricensis. A checklist of reported species. Master Thesis. Tulane University. 219p. GILBERTSON, R.L. & L. RYVARDEN. 1986. North American Polypores. Vol. I. Fungiflora, Oslo, Norway. 433p. GILBERTSON, R.L. & L. RYVARDEN. 1987. North American Polypores. 1987. Vol. 2. Fungiflora, Oslo, Norway. 452p. HOLMGREN, P.K., W. KEUKEN & E. K. SCHOFIELD. 1981. Index Herbariorum. Part I. The Herbaria of the World. 7th. Ed., Regnum veg. 106:1-452. LARSEN, M.J. & L.A. COBB POULLE. 1990. **Phellinus** (Hymenochaetaceae). A survey of the world taxa. 206p. LOWE, J.L. 1963. A synopsis of **Poria** and similar fungi from the tropical regions of the world. Mycologia 55(4):453-486. LOWE, J.L. 1966. Polyporaceae of North America. The Genus **Poria**. SUNY. College of Forestry, Syracuse, N.Y. Techn. Pub. 90. 183p. LOWE, J.L.

1976. On **Polyporus sobrius.** Kew Bulletin 31(3):753-754.
MURRILL, W.A. 1915. Tropical Polypores. New York. 113p.
RYVARDEN, L. & I. JOHANSEN. 1980. A preliminary Polypore Flora of East Africa. Fungiflora, Oslo, Norway. 636p.
SYDOW, H. 1925. Fungi in itinere costaricensi collecti. Pars prima. Ann. Mycologici 23:308-429.

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ADDITIONS TO AND NOTES ON THE PHAEOSPHAERIACEAE (PLEOSPORALES, LOCULOASCOMYCETES)

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SUMMARY

A revised key to 14 North American genera of the Phaeosphaeriaceae is presented. Recent information on genera and species is summarized and descriptions are provided for some little-known species. Several new combinations are necessary: *Didymella muhlenbergiae* (Ellis) Barr, *D. panici* (F. L. Stevens) Barr, *D. thalictri* (Ellis & Dearness) Barr, *Kalmusia utahensis* (Ellis & Everh.) Huhndorf & Barr, *Paraphaeosphaeria filamentosa* (Ellis & Everh.) Barr, *P. maximiliani* (Ellis & Everh.) Barr, *Phaeosphaeria acori* (Dearness & House) Barr, *P. infuscans* (Ellis & Everh.) Barr, *P. scirpicola* (Earle) Barr. Newly described species include *Didymella viridimontana*, *Nodulosphaeria novae-angliae*, *Paraphaeosphaeria conglomerata*, *P. quadriseptata*, *Phaeosphaeria hesperia*.

The Phaeosphaeriaceae as outlined by Barr (1987) contains an assortment of genera, typically developing in herbaceous stems or monocot leaves, culms and flowers, but known also from woody substrates. O. Eriksson and Hawksworth (1991) included two genera that seem unlikely to belong in the family. *Entodesmium* is better disposed in the Lophiostomataceae because of the abrupt, beaklike apex of small darkened cells and the periphysate ostiole, illustrated by Shoemaker (1984b). The species of *Peridiothelia*, described by Hawksworth (1985), could be arranged in the Pleomassariaceae. *Sulcispora* (Shoemaker and Babcock 1989c) was erected for the European *S. pleurospora* (Niessl) Shoemaker & Babcock and is distinctive from species of *Phaeosphaeria* by opaque brown ascospores that bear longitudinal furrows in the walls. *Hadrospora*, recently described (Boise 1989), belongs in the Phaeosphaeriaceae. *Metameris* is removed from synonymy under *Scirrhia* where it was assigned by L. and K. Holm (1978) and is reinstated in this family also. Because of the additions and changes to genera in this family, a revised key to genera known in North America is provided.

1. Ascospores one septate, rarely more, hyaline or lightly pigmented..2
1. Ascospores more than one septate, hyaline, lightly pigmented or brown......................................4
2. Ascospores narrowly oblong to fusoid; biotrophic in *Chondrus*................................*Lautitia*
2. Ascospores ellipsoid, fusoid or oblong; hemibiotrophic or saprobic in ferns and angiosperms........3
3. Ascomata as locules in pseudoparenchymatous stroma; in ferns......................................*Metameris*
3. Ascomata separate or gregarious, connected by hyphae at times; in angiosperms..........................*Didymella*
4. Ascospores transversely septate, rarely longitudinal septum inserted................................5
4. Ascospores regularly muriform.................12
5. Ascomata gregarious, often connected in groups, opening by long slit; biotrophic in flowers of *Juncus*; ascospores hyaline, three septate........................*Bricookea*
5. Ascomata separate or gregarious or as locules in stroma, opening by pore; usually hemibiotrophic or saprobic; ascospores hyaline or shades of brown...........6
6. Ascospores narrowly obovoid with supramedian enlarged cell or elongate to scolecosporous, three or many septate..7
6. Ascospores fusoid, ellipsoid, oblong, with or lacking enlarged cell, usually two to seven septate.8
7. Ascospores scolecosporous, lacking enlarged cell and appendages; ascomata lacking setae at apex..*Ophiosphaerella*
7. Ascospores scolecosporous in some species, or more frequently obovoid with enlarged cell, often with terminal appendages; ascomata often with short or conspicuous setae at apex..................................*Nodulosphaeria*
8. Ascomata as locules in pseudoparenchymatous stroma; in ferns........................*Rhopographus*
8. Ascomata separate or gregarious, connected by hyphae or contained within stromatic mass at times; in angiosperms...9
9. Ascospores large, fusoid, brown..............*Hadrospora*
9. Ascospores small to medium, variable in shape and pigment..10
10. Ascospores oblong, primary septum and enlarged cell submedian....................*Paraphaeosphaeria*
10. Ascospores usually fusoid or ellipsoid, primary septum and enlarged cell median or somewhat supramedian, rarely submedian...........................11
11. Ascospores light to yellowish brown; ascomata thin walled, usually in monocots, lycopods or equiseti...*Phaeosphaeria*
11. Ascospores clear brown, reddish brown or dark brown; ascomata usually firm walled, usually in dicot stems or

woody branches....................................*Kalmusia*

12. Ascospores laterally compressed, one (rarely two) longitudinal septa not visible in side view...*Graphyllium*

12. Ascospores not laterally compressed, longitudinal septa visible in both side and face views..........13

13. Ascospore wall thickened, verrucose; in large monocots ....*Montagnula*

13. Ascospore wall thin, smooth or verruculose at most; in dicot stems or woody substrates...............*Chaetoplea*

Bricookea originally included only *B. sepalorum* (Vleugel) Barr on flowers of *Juncus* (Barr 1982). Shoemaker and Babcock (1989a) restricted this species to European specimens whose ascospores are 15-18 x 5-7 µm and described *B. barrae* Shoemaker & Babcock for the North American component, whose ascospores are 26-33 x 9-11 µm in correspondingly larger asci. Both species have ascomata with a slit-like opening. *Bricookea barrae* is now known on *Juncus parryii* Engelm. from Colorado, Idaho, Montana, Nevada, Utah, and Wyoming (Rogerson, personal communication, collections in NY) in addition to the western coastal states of the USA and British Columbia in Canada.

Chaetoplea was enlarged (Barr 1990b) to include 17 dictyosporous species, many on old wood, whose ascomata are sphaeroid beneath a clypeus or are more nearly globose and collabent.

Didymella was studied in some detail by Corlett (1981), who described and illustrated both North American and some European species. He agreed generally with the subgeneric arrangements proposed by Corbaz (1957) and recognized two major groups of species as well as a heterogeneous group. The group of *D. exigua* (Niessl) Sacc. forms the central core of the genus. The ascomata are small, usually less than 200 µm wide, the peridium is thin, asci are relatively small, usually less than 70 µm long, and ascospores have a median septum. Most of the species in the heterogeneous intermediate group could be inserted in *Didymella*, where the ascomata are larger but thin walled and the ascospore septum may vary in position. Barr and Rogerson (1983) introduced *D. stromatica* and Sivanesan (1984) added several species having anamorphs in *Ascochyta* that are known from North America.

Members of the group of *D. eupyrena* Sacc. have medium-sized ascomata, to 400 µm or more wide, the peridium of large thick-walled cells, often thickened laterally, larger asci, up to 100 µm long, and ascospores with submedian septum. From the heterogeneous group, *D. castillejae* Wehm. and *D. phacae* Corbaz are assigned to this group of species, and show variation in position of the septum. These species and some additional ones, e.g., *D. anomala* (Ellis & Everh.) Shoemaker & Babcock (Shoemaker and Babcock 1987a), are to be referred to *Didymolepta* of the Leptosphaeriaceae. Corlett included *D. abieticola* Vainio in his account, but suggested that the species may be better disposed in *Massarina* according to clypeate ascomata and shape of ascospores. He noted that *Arthopyrenia* is close in general aspects. Disposition in the latter genus is preferable, for ascomata develop in the epidermis or beneath cuticle, rather than in periderm tissues. Because of the different approach to *Didymella* and the addition of several entities, a key to North American species is presented below.

1. Ascospore septum supra- or submedian..................2
1. Ascospore septum median or nearly so..................6
  2. Ascospore septum supramedian, ascospores 24-40 x 5-8 µm, fusoid..........................*D. festucae*
  2. Ascospore septum submedian, ascospores shorter, more obovoid.......................................3
3. Ascospores 20-26 x 7.5-9 µm; in *Carex*.....*D. proximella*
3. Ascospores smaller, up to 20 µm long..................4
  4. Ascospores 12-15 x 4-5 µm; ascomata closely grouped beneath blackened crust of hyphae, in *Thermopsis*............................*D. stromatica*
  4. Ascospores 14.5-20 µm long; ascomata separate or gregarious, not grouped beneath blackened crust, individually clypeate at times......................5
5. Ascomata sphaeroid, gregarious or separate beneath thin clypeus; ascospores 14.5-18(-20) x 5.5-7 µm....*D. trifolii*
5. Ascomata nearly globose, often in long rows and united by copious hyphae; ascospores 17-20 x 5-6 µm...*D. muhlenbergiae*
  6. Ascospores wide (2-2.5:1).......................7
  6. Ascospores narrower (2.5-3-4-4.5:1).............9
7. Ascospores 8-10 x 3.5-4 µm....................*D. panici*
7. Ascospores larger; anamorphs in *Ascochyta*............8
  8. Ascospores 8-18 x 4-8 µm; in various legumes...*D. pinodes*
  8. Ascospores 13-19 x 7-9 µm; in *Melilotus*...*D. lethalis*
9. Ascospores narrowly fusoid (4-4.5:1)................10
9. Ascospores wider, obovoid (2.5-3:1).................12
  10. Ascospores small, 10-13 x 2.5-3 µm; in *Ambrosia*...*D. prominens*
  10. Ascospores larger.............................11
11. Ascospores 20-22.5 x 5-6 µm; in *Typha*..*D. viridimontana*
11. Ascospores 12-20 x 3-4.5 µm; in *Carex*.....*D. glacialis*
  12. Ascospore ends obtuse.........................13
  12. Ascospore ends acute..........................15
13. Ascospores 14-18 x 6-7 µm; anamorph *Ascochyta*; in cucurbits...................................*D. bryoniae*
13. Ascospores 13.5-16(-22.5) µm long..................14

14. Ascospores 5-6.5 µm wide; in *Onosmodium*.......... ....*D. onosmodina*
14. Ascospores 5.5-8 µm wide; in *Rubus*...*D. applanata*
15. Ascospores (10-)12-16(-17.5) x (3.5-)4-7 µm.........16
15. Ascospores larger......................................18
16. Ascospores becoming light yellowish brown........ ....*D. thalictri*
16. Ascospores remaining hyaline..................17
17. On *Chrysanthemum*; anamorph *Ascochyta*.....*D. ligulicola*
17. On various herbs; anamorph *Phoma*.............*D. exigua*
18. Ascospores 14.5-21 x 5-6.5(-8) µm; in *Nepeta*..... ....*D. catariae*
18. Ascospores 16-21.5 x 4.5-7(-8) µm; in *Helleborus*, *Epilobium*................................*D. hellebori*

Didymella catariae (Cooke & Ellis) Sacc. is closely related to *D. exigua* but has slightly larger ascospores, 14.5-21 x 5-6.5(-8) µm.

Didymella muhlenbergiae (Ellis) Barr, comb. nov. Fig. 1a,b

Dothidea muhlenbergiae Ellis, Bull. Torrey Bot. Club 8: 74. 1881.

Leptosphaeria muhlenbergiae (Ellis) Niessl, Hedwigia 22: 33. 883. (non *L. muhlenbergiae* Rehm, Ann. Mycol. 13: 5. 1915).

Phyllachora muhlenbergiae (Ellis) Sacc. Syll. Fung. 2: 604. 1883.

Ascomata forming elongate rows or groups up to 1 mm long, connected by abundant brown hyphae, immersed, appearing superficial when epidermis sloughed, nearly globose, 150-220 µm wide, 120-200 µm high, apex papillate, ostiole filled with hyaline cells; peridium of brown pseudoparenchymatous cells, 20-30 µm wide, inner layer of pallid compressed rows of cells, surface roughened by protruding cells and hyphae. Asci 40-70 x 14-20 µm, oblong. Pseudoparaphyses cellular, gelatinizing. Ascospores 17-20 x 5-6 µm, hyaline, fusoid, straight or inequilateral, septum submedian, constricted; wall smooth; two globules per cell; overlapping biseriate to triseriate in the ascus.

In culms of *Muhlenbergia*.

Material examined: USA: NEW JERSEY: Gloucester Co., Newfield, sine data, J. B. Ellis N.A.F. 482 (NY, holotype labelled "Ellis Collection" bearing notes in packet, isotypes); May 1882, F. Col. 737 (NY).

Conidiomata are mixed with the ascomata and are similar in aspect. Conidia are 18-22 x 6 µm, hyaline, oblong, 0-3-septate. These conidia may be the reason that Niessl referred the species to *Leptosphaeria*, for he described sporidia as 20-25 x 6-8 µm, 3-4-septate (Ellis and Everhart 1892). The ascospores of *D. muhlenbergiae* are quite similar to those of *D. trifolii*.

D. onosmodina (Peck & Clinton) Sacc. (Barr et al. 1986) has ascospores with obtuse ends, slightly larger than those of the more acute-ended *D. exigua* (13.5-16 x 5-6.5 µm vs. 12-16 x 4-6 µm), and is close to *D. applanata* (Niessl) Sacc.

Didymella panici (F. L. Stevens) Barr, comb. nov. Fig.1c,d
Otthia panici F. L. Stevens, Trans. Illinois Acad. Sci. 10: 185. 1917.

Ascomata forming elongate rows, sides united at times, sphaeroid, 90-117 µm wide, 89-90 µm high; apex short papillate; peridium narrow. Asci 30-50 x 7-9 µm. Pseudoparaphyses narrowly cellular. Ascospores 8-10 x 3.5-4 µm, hyaline becoming light brown, oblong or obovoid, one septate, nearly median, slightly constricted; wall smooth.

In leaves of *Panicum maximum* Jacq.

Material examined: PUERTO RICO: Preston's Ranch, 31 Dec 1913, F. L. Stevens 6659 (isotype); Jayuya, 17 Dec 1913, F. L. Stevens 5994 (NY).

The presence of pseudoparaphyses in the centrum and the shape of asci indicate *Didymella* rather than *Mycosphaerella*, although the small ascospores may suggest the latter. *Otthia* is an entirely different taxon belonging to the Cucurbitariaceae, whose ascospores are larger and distinctly brown.

Didymella prominens Ellis & Everh. J. Mycol. 2: 101. 1886. Fig. 1e,f
Cercidospora prominens (Ellis & Everh.) Kuntze, Rev. Gen. Pl. 3: 454. 1898.

Ascomata gregarious, subepidermal, sphaeroid, 130-170 µm wide, 100-130 µm high; apex rounded; peridium up to 35 µm wide, surface shining black, with brown hyphae connecting ascomata. Asci 40-52 x 7.5-12 µm. Pseudoparaphyses narrowly cellular. Ascospores 10-13 x 2.5-3 µm, hyaline, narrowly fusoid, one septate, nearly median, slightly constricted; wall smooth.

On *Ambrosia trifida* L.

Material examined: USA: LOUISIANA: Pointe à la Hache, May 1886, A. B. Langlois, N.A.F. 1796 (isotype, NY).

The ascospores are suggestive of *D. glacialis* Rehm in shape, but sizes throughout are larger in that species on *Carex*. Incidentally, *D. oxyspora* (J. J. Davis) Shoemaker & Babcock (Shoemaker and Babcock 1989c) scarcely seems to differ from *D. glacialis*.

Didymella thalictri (Ellis & Dearness) Barr, comb. nov. Fig. 1g
Didymosphaeria thalictri Ellis & Dearness, Proc. Canad. Inst. n.s. 1(3): 89. 1897.

Ascomata separate or few grouped, subepidermal, sphaeroid or ellipsoid, 210-350 µm long, 200-250 µm wide, 120-180 µm high; apex rounded, short papillate; peridium ca. 14 µm wide, with brown hyphae extending as thin clypeus around upper peridium. Asci 44-67 x 7.5-9 µm. Pseudoparaphyses narrowly cellular, 2-3 µm wide. Ascospores 13-17.5 x 4-5.5 µm, hyaline becoming light yellowish brown, fusoid, usually inequilateral to slightly curved, one septate, median, constricted; wall verruculose; overlapping biseriate in the ascus.

In stems of *Thalictrum*.

Material examined: CANADA: ONTARIO: *T. polygamum* Muhl., London, Aug 1895, J. Dearness, N.A.F. 3324 (Dearness Herb. in DAOM numbered "2297" by Dearness; NY). QUEBEC: *T. dioicum* L., Lake Munroe, Mt. Tremblant Park, 25 Jul 1957, M. E. Barr 2110 (NY).

Although the ascospores become light dull brown and verruculose, this species cannot belong in *Didymosphaeria* because of ascomata and centrum; it fits well as a species of *Didymella*. Scheinpflug (1958) retained the species in *Didymosphaeria* and included *D. marchantiae* Starb. as a synonym. While asci and ascospores are similar, the ascomata of *D. marchantiae* are globose and much smaller, 84-112 µm diam, according to the copy of Krieger, Fungi saxonici 1924 (MICH) examined.

Didymella viridimontana Barr, sp. nov. Fig. 1h,i

Ascomata immersa sphaeroidea 220-250 µm lata 140-165 µm alta, peridia circa 20 µm lata. Asci bitunicati 60-85 x 12-15 µm oblongi. Pseudoparaphyses cellulosae. Ascosporae 20-22.5 x 5-6 µm hyalinae fusoideae uniseptatae constrictae biseriatae. Holotypus in *Typhae latifoliae* L. "USA: Vermont: Lamoille Co., Neighborhood Trail, Johnson, 11 Aug 1964," a M. E. Barr 4500 lectus in Herb. NY depositus.

Ascomata subepidermal, often in rows, sphaeroid, 220-250 µm wide, 140-165 µm high, apex rounded; peridium ca. 20 µm wide, outermost cells darkened in upper regions, pallid below, surrounded by weft of light brown hyphae. Asci 60-85 x 12-15 µm, oblong. Pseudoparaphyses narrowly cellular. Ascospores 20-22.5 x 5-6 µm, hyaline, fusoid, often inequilateral, one septate, nearly median, constricted; wall smooth; overlapping biseriate in the ascus.

In leaves of *Typha latifolia*, known from the type collection.

It is possible that this could be an immature state of *Phaeosphaeria typhae* (Karsten) Shoemaker & Babcock, but the ascomata are sphaeroid rather than globose, asci are larger, ascospores are somewhat wider, and there is no indication of pigmentation or of additional septa.

Graphyllium is an earlier name for *Comoclathris and Platyspora*. Barr (1990b) included five species for North America. Shoemaker (personal communication) has a manuscript in preparation.

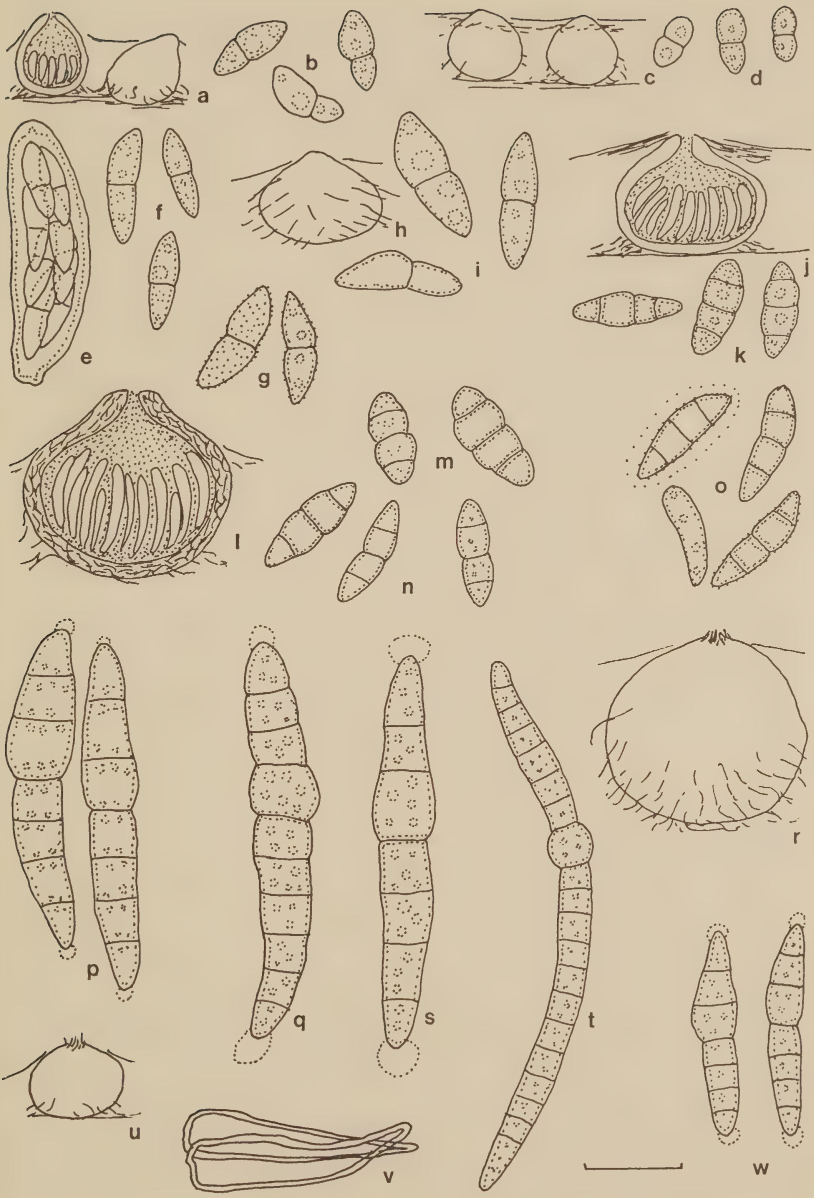
Hadrospora was described to accommodate two of the species removed from *Trematosphaeria* (Boise 1989). Both species have large, fusoid, brown, transversely septate ascospores in oblong or ovoid asci. Only *H. fallax* (Mouton) Boise, the type species, is known at present from North America. This species usually occurs on wood; an isolate from soybean nematode cysts (Carris and Glawe 1989) enlarges its range of substrates.

Kalmusia was erected by Niessl (1872) for *K. ebuli* on branches of *Sambucus*. The original specimens evidently disappeared soon thereafter, for Winter (1885), Berlese (1891), and Lindau (1897) illustrated the species only from Niessl's figures. These show an immersed, sphaeroid ascoma with central, stout papilla, surrounded by hyphae in the substrate, stipitate ascus with septate paraphyses, and brown, three-septate, inequilateral ascospores.

Diapleella was described by Munk (1953) as a diaporthaceous genus, based upon *Sphaeria clivensis* Berk. & Broome, from herbaceous stems. Study of authentic European collections showed that the asci are bitunicate, and this fact is confirmed by Shoemaker's (1984a) description and illustrations from North American collections. As in *K. ebuli*, the immersed ascomata bear a well-developed apical papilla and the similarities in other features indicate that *Diapleella* does not differ generically from *Kalmusia*.

Dendropleella was also described by Munk (1953), based upon *Sphaeria hirta* Fries on branches of *Sambucus*. Munk (1957) observed that *Kalmusia ebuli* could be identical, and that if it were so, *Kalmusia* would be the name to use. Munk's choice of *Sphaeria hirta* is untenable for two reasons. Firstly, Rabenhorst (1858) utilized the name to typify *Nodulosphaeria*. Secondly, the specimens of Scler. suec. n. 17 (UPS) represent only an anamorphic fungus, a species of *Hendersonia* (L. Holm, personal communication). [The problem for *Nodulosphaeria* has

Fig. 1. a, b. *Didymella muhlenbergiae*: a, ascomata in vertical section and outline, b, ascospores. c, d. *D. panici*: c, ascomata in outline, d, ascospores. e, f. *D. prominens*: e, ascus, f, ascospores. g. *D. thalictri*, ascospores. h, i. *D. viridimontana*: h, ascoma in outline, i, ascospores. j, k. *Kalmusia coniothyrium*: j, ascoma in vertical section, k, ascospores. l, m, n. *K. ebuli*: l, ascoma in vertical section, m, ascospores from *Lonicera*, n, ascospores from *Sambucus*. o. *K. utahensis*, ascospores. p. *Nodulosphaeria aucta*, ascospores. q, r. *N. epilobii*, q, ascospore, r, ascoma in outline. s. *N. ladina*, ascospore. t. *N. megalospora*, ascospore. u, v, w. *N. novae-angliae*: u, ascoma in outline, v, two apical setae, w, ascospores. Standard line = 150 µm for ascomata, 15 µm for ascus and ascospores.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already been discussed, in a proposal to conserve the genus and its type species *N. derasa* (Berk. & Broome) Holm, by Barr and L. Holm, 1984.] The fungus on *Sambucus* in Europe has generally been called *Massaria hirta* (Fr.) Fuckel, and authentic specimens are consonant with the description and illustrations of *Kalmusia ebuli*.

The generic synonymy is proposed as:

Kalmusia Niessl, Verh. Naturf. Vereins Brünn 10: 204. 1872.
Diapleella Munk, Dansk Bot. Arkiv. 15(2): 74. 1953.
Dendropleella Munk, Dansk Bot. Arkiv. 15(2): 125. 1953.

Thyridaria Sacc. has also been compared to *Kalmusia* (Winter 1885); Lindau (1897) reduced *Thyridaria* to subgeneric level under *Kalmusia*. *Thyridaria broussonetiae* (Sacc.) Trav. and other species of the genus are superficially similar to *K. ebuli* (Wehmeyer 1941), but the centrum is melanommataceous and *Thyridaria* is assigned to the Platystomaceae of Melanommatales (Barr 1987, 1990a). *Kalmusia* is a member of the Phaeosphaeriaceae of the Pleosporales sensu Barr (1987), and the genus is utilized to include both *K. ebuli* and *K. clivensis*, as well as closely related species.

A number of species have been described in or transferred into *Kalmusia* that do not belong in the genus. For example, *K. hypotephra* (Berk. & Broome) Sacc. and *K. hemitapha* (Berk. & Broome) Sacc., according to the type collections (IMI) are both synonymous with *Clypeosphaeria mamillana* (Fr.) Lambotte in the Xylariales (Barr 1989b). Von Höhnel (1923) had noted this, and also included *K. dealbata* Sacc. as a form of *C. notarisii (= C. mamillana)*. Some other names have not been restudied and disposed satisfactorily as yet.

Key to Species

1. Ascospore wall firm, often becoming verruculose; typically in herbaceous stems..........................2
1. Ascospore wall thin, smooth; typically in woody stems.3
    2. Ascomata small, 130-180 µm wide; ascospores 15-21 x 4.5-5 µm..............................*K. utahensis*
    2. Ascomata medium sized, 350-550 µm wide; ascospores larger, (15-)17-27(-32) x (5-8(-11) µm...*K. clivensis*
3. Ascomata small, 220-275(-440) µm wide, hyphae often forming blackened clypeus; ascospores (11-)12-15(-17) x 3.5-5 µm..................................*K. coniothyrium*
3. Ascomata small to medium sized, 180-440 µm wide, hyphae sparse, not or rarely forming blackened clypeus; ascospores larger, 14-23 x (3-)4-6(-7) µm............*K. ebuli*

Kalmusia clivensis (Berk. & Broome) Barr, Mycotaxon 29: 504. 1987.
Sphaeria clivensis Berk. & Broome, Ann. Mag. Nat. Hist. Ser. 2, 9: 379. 1852.

Leptosphaeria clivensis (Berk. & Broome) Sacc. Syll. Fung. 2: 16. 1883.
Diapleella clivensis (Berk. & Broome) Munk, Dansk Bot. Arkiv. 15(2): 75. 1953 (non val. publ., ICBN Art.33.2).
Leptosphaeria galiorum Sacc. var. *lapsanae* Sacc. & Briard, Rev. Mycol. 7: 209. 1885.
Leptosphaeria steironematis Ellis & Everh. Proc. Acad. Nat. Sci. Philadelphia 42: 237. 1891.
Leptosphaeria arunci Zeller, Mycologia 19: 134. 1927.
Leptosphaeria longipedicellata Miller & Burton, Mycologia 34: 2. 1942.

Ascomata 250-440 µm diam, 220-330(-385) µm high, apex 50-165 µm high and wide; peridium (12-)25-60 µm wide, reddish brown, blackened over erumpent papilla, hyphae pallid or reddish brown, at times forming small clypeus over apex. Asci (55-)75-105(-150) x 10-18 µm, stipe elongate to 45-50 µm at times. Pseudoparaphyses narrowly cellular. Ascospores (15-)17-27(-32) x 5-8(-11) µm, clear reddish brown to dark brown, ellipsoid fusoid, ends usually acute, inequilateral or slightly curved, (0-1-)3-(4-)septate, slightly constricted at first-formed septum; wall usually verruculose, at times surrounded by gel coating, overlapping biseriate in the ascus.

In herbaceous stems or woody twigs, north temperate zone.

Selected material examined: ENGLAND: King's Cliffe, Jul 1850 (UPS, slide ex holotype K); *Centaurea nigra* L., Chute Meadow, Lambriggan, W. Cornwall, 9 May 1942, F. Rilstone (NY ex IMI 15546). SCOTLAND: Wester Ross, Rassal N. N. Reserve, 2 Jun 1982, P. F. Cannon (NY). CZECHOSLOVAKIA: *Solidago canadensis* L. Petrak, Mycotheca gen. 571 as *Kalmusia ebuli*, Mähr-Weisskirchen, May 1924 (NY). CANADA: BRITISH COLUMBIA: *Cytisus scoparius* (L.) Link, Sidney, 29 Apr 1990, M. E. Barr 7163; 17 Feb 1991, M. E. Barr 7437; Mill Bay, 16 Nov 1990, M. E. Barr 7382; *Cirsium*, 2 Jul 1990, M. E. Barr 7198, *Daucus carota* L., M. E. Barr 7201; *Alnus rubra* Bong., Sidney, 5 Aug 1990, M. E. Barr 7242 (all DAOM). ONTARIO: *Steironema ciliatum* = *Lysimachia ciliata* L., London, May 1890, J. Dearness, N.A.F. 2615 (Dearness Herb. in DAOM, NY, isotype *Leptosphaeria steironematis*). USA: COLORADO: *Rosa*, W. Redfeather Lakes, Roosevelt Nat'l Forest, Larimer Co., 4 Aug 1984, M. E. Barr 7008 (NY). MAINE: ? aspen, E. Millinocket, Penobscot Co., 29 Jul 1962, M. E. Barr 3500 (NY). MICHIGAN: *Acer*, thin twig, Gill & Elder Roads, Carp Lake, Emmet Co., 11 Sep 1969, M. E. Barr 5527 (NY). UTAH: Cedar Mt., Iron Co., 17 Aug 1973, M. E. Barr 6085 (NY).

Shoemaker (1984a) provided a detailed description and illustrations for this species. He listed collections from Ontario, Michigan and New York on assorted herbaceous stems. A few collections on woody substrates are included above, for they do not differ microscopically from the material on herbaceous stems. Shoemaker stressed the complex three-layered peridium of ascomata, although it is not always clearly visible, and the long-stipitate asci, whose stipes vary in length among collections. A recent collection (Barr 7198) showed a three-layered peridium in the upper regions, and the pallid mid layer appears to be still-unpigmented clypeal tissue. Shoemaker suggested that *Leptosphaeria longipedicellata* Miller & Burton was probably identical and Huhndorf (1991) has determined that it is indeed the same, as are *L. arunci* and *L. galiorum* var. *lapsanae*.

Kalmusia coniothyrium (Fuckel) Huhndorf, Bull. Nat. Hist. Surv. Illinois 34: in press. 1991. Fig. 1j,k

Sphaeria coniothyrium Fuckel, Jahrb. Nassauischen Ver. Naturk. 23-24: 115. 1870.

Leptosphaeria coniothyrium (Fuckel) Sacc. Nuov. Giorn. Bot. Ital. 7: 317. 1875.

Melanomma coniothyrium (Fuckel) L. Holm, Symb. Bot. Upsal. 14(3): 56. 1957.

Diapleella coniothyrium (Fuckel) Barr in Barr et al., New York State Mus. Bull. 459: 30. 1986.

Sphaeria hendersoniae Ellis, Grevillea 6: 14. 1877.

Clypeosphaeria hendersoniae (Ellis) Sacc. Syll. Fung. 2: 91. 1883.

Leptosphaeria hendersoniae (Ellis) Berlese, Icon. Fung. 1: 53. 1892.

Sphaeria melantera Peck, Rep. New York State Mus. 29: 61. 1878 (for 1875).

Ascomata gregarious, sides connected at times, often forming blackened areas on canes, 220-275(-340) µm diam, 140-180(-330) µm high, apical papilla short and wide; peridium brown, 6-20 µm wide at sides and base, blackened and thickened by clypeal tissues above, hyphae brown. Asci 40-85 x 6-9 µm. Pseudoparaphyses narrowly cellular. Ascospores (11-)12-15(-17) x 3.5-5 µm, yellowish brown or light reddish brown, narrowly obovoid, ends usually obtuse, (1-)3-septate, slightly constricted at first-formed septum, cell above often enlarged; wall thin, smooth; overlapping biseriate or partially uniseriate in the ascus.

Anamorph: conidiomata up to 260 µm diam; conidiogenous cells phialidic; conidia 2.5-5 x 1.5-2.5 µm, light brown, one celled, ellipsoid (*Coniothyrium fuckelii* Sacc. = *Microsphaeropsis*; Punithalingam 1980, Sivanesan 1984).

On canes of *Rubus* spp., north temperate zone (including India: Muller 1958); occasionally on other woody plants.

Material examined: CANADA: BRITISH COLUMBIA: *R. laciniatus* Willd., Sidney, 30 Mar 1990, M. E. Barr 7151 (DAOM). USA: ILLINOIS: Giant City State Park near Makanda, Union Co., 12 Aug 1981, M. E. Barr 6884 (MASS). MASSACHUSETTS: Franklin Co.: Sunderland, 25 Apr 1919, P. J. Anderson (MASS 2577); Bernardston, 23 Sep 1926, F. L.

Egate (MASS 3038); *R. occidentalis* L., North Amherst, 21 Jul 1959, M. E. Barr 2589; Baptist Hill, Conway, 9 May 1971, M. E. Barr 5756, 7 Apr 1974, M. E. Barr 6194, 24 Feb 1980, M. E. Barr 6710, *Robinia pseudoacacia* L., 2 Mar 1980, M. E. Barr 6717 (all MASS). NEW JERSEY: Newfield, Gloucester Co., Mar 1878, J. B. Ellis, N.A.F. 581 (MASS). NEW YORK: *R. strigosus* Michx., Center, Albany Co., C. H. Peck (NYS, holotype *Sphaeria melantera*).

The species often forms blackened areas on canes of *Rubus*, and this habit and the small, rather pallid ascospores are diagnostic. *Leptosphaeria coniothyrium* (Fuckel) Sacc. is the name most often used; the fungus is anomalous in that genus. L. Holm (1957) transferred it to *Melanomma*, mainly because of similar ascospores. Not only are the ascomata immersed and usually covered by a blackened clypeus, but the peridium and hamathecium differ strongly from those of *M. pulvis-pyrius* (Pers.: Fr.) Fuckel. Munk (1957) suggested that *Leptosphaeria coniothyrium* could be a link between *Leptosphaeria* and *Dendropleella*. Huhndorf (1991) has chosen a neotype for *Sphaeria hendersoniae* Ellis, one of the synonymous names.

Kalmusia ebuli Niessl, Verh. Naturf. Vereins. Brunn 10: 204. 1872. Fig. 11,m,n

Massaria hirta (Fr.) Fuckel, Jahrb. Nassauischen Ver. Naturk. 23-24: 155. 1870, non *Sphaeria hirta* Fr. Syst. Mycol. 2: 483. 1823.

Karstenula hirta (Fr.) von Höhnel, Sitzungsber. Kaiserl. Akad. Math.-Naturwiss. Kl. Abt. 1, 126: 371. 1917.

Dendropleella hirta (Fr.) Munk, Dansk Bot. Arkiv. 15(2): 126. 1953 (non val. publ. ICBN Art. 33.2).

Ascomata separate or gregarious, (180-)200-400(-600) µm wide, (150-)200-275(-300) µm high, apical papilla 100-130 µm high and wide; peridium 15-30(-60) µm wide, reddish brown, surrounded by brown hyphae. Asci (55-)82-114(-150) x 7.5-11(-13) µm. Pseudoparaphyses narrowly cellular. Ascospores 14-23 x (3-)4-6(-8.5) µm, yellowish brown, light dull brown or light reddish brown, ellipsoid, ends obtuse, (1-)3-(4-)septate, slightly constricted at first-formed septum; wall thin, smooth; overlapping biseriate or partially uniseriate in the ascus.

Anamorph: conidiomata 330-440 µm diam; conidiogenous cells phialidic, lining locule; conidia 4-5 x 2 µm, light brown, one celled (*Microsphaeropsis hirta* (Sacc.) von Höhnel); conidiomata 550-600 µm diam; conidiogenous cells lining locule, enteroblastic phialidic; conidia 11-17 x 4.5-5 µm, bright brown, ellipsoid, 0-1-3-septate (*Hendersonia hirta* Currey = *Microdiplodia*).

In branches of *Sambucus* spp., north temperate zone; also known on other woody plants.

Material examined: EUROPE: AUSTRIA: Fuckel, Fungi rhen. 2326 and as Herbier Barbey-Boissier 90 (NY).

Bohemia, Enlau, spring 1873, Thümen, Fungi austriaci 1149 (FH, NY). FRANCE: Malmedy, C. Roumeguère, Fungi Gallici exs. 1479 (NY). NORTH AMERICA: CANADA: BRITISH COLUMBIA: *Holodiscus discolor* (Pursh.) Maxim., Sidney, 5 Jun 1990, M. E. Barr 7184, 3 Oct 1990, M. E. Barr 7334; *Rhamnus purshiana* DC., Sidney, 16 Feb 1991, M. E. Barr 7432 (DAOM). QUEBEC: Lac Munroe, Mt. Tremblant Park, 26 Jul 1957, M. E. Barr 2126; Mt. Albert, Gaspesian Prov. Park, 20 Aug 1957, M. E. Barr 2212 (NY). USA: ALASKA: Bird Creek Campground, near Anchorage, 21 Jun 1970, W. B. & V. G. Cooke 42235 (NY). COLORADO: Fourth of July Campground, NW Nederland, Boulder Co., 21 Aug 1964, C. T. Rogerson (NY). MAINE: Norcross, Penobscot Co., 30 Jun 1962, M. E. Barr 3265; *Cornus amomum* Mill., Appalachian Trail, Bigelow, Franklin Co., 8 Aug 1971, M. E. Barr 5787b (NY). MASSACHUSETTS: *Lonicera canadensis* Marsh., Baptist Hill, Conway, Franklin Co., 30 Apr 1978, M. E. Barr 6432, Nov 1986, M. E. Barr 7123, 30 Aug 1987, M. E. Barr 7125, 31 Jan 1988, M. E. Barr 7137 (all NY). MICHIGAN: U.Michigan Biological Station, Cheboygan Co., 12 Jul 1953, M. E. Barr 949, 21 Aug 1953, M. E. Barr 1465; *Tilia*, Colonial Point, Burt Lake, Emmet Co., 6 Sep 1969, M.E. Barr 5395c; Gill & Elder Roads, Carp Lake, Emmet Co., 11 Sep 1969, M. E. Barr 5524b (all NY). NEW HAMPSHIRE: Rocky Branch trail, Jericho, White Mts. Nat'l Forest, Carroll Co., 12 Aug 1963, M. E. Barr 4063 (NY).

Kalmusia ebuli typically develops under the periderm in groups that are united by brown hyphae, sometimes producing a reddish coloration of the periderm, sometimes appearing superficial when the periderm is exfoliated. Ascomata show considerable variation in size and thickness of the peridium, as well as in ascus and ascospore sizes. Von Höhnel (1917) described variations in ascomata when these were on thick or thin twigs, and (von Höhnel 1920) decided that the small form on thin twigs with lighter brown ascospores was identical with *Cladosphaeria sambuci-racemosae* Otth.

Kalmusia utahensis (Ellis & Everh.) Huhndorf & Barr, comb. nov. Fig. 1o

Leptosphaeria utahensis Ellis & Everh. N. Amer. Pyrenomyc. 361. 1892.

Ascomata immersed, gregarious, 130-200 µm diam, 104-130 µm high, apical papilla short, dark; peridium 10-17 µm wide, brown, hyphae brown, at times forming small clypeus. Asci (40-)45-75 x 8-13 µm. Pseudoparaphyses narrowly cellular. Ascospores 15-21 x 4.5-5 µm, reddish brown or yellowish brown, ellipsoid fusoid, inequilateral, (0-1-)3-septate, not constricted at septa; wall thick, verruculose, at times surrounded by narrow gel coating; overlapping biseriate in the ascus.

In overwintered stems, mountains, western North America.

Material examined: USA: COLORADO: Larimer Co., *Thermopsis divaricarpa* Nelson, S. Redfeather Lakes, Roosevelt Nat'l Forest, Larimer Co., 4 Aug 1984, M. E. Barr 7018; umbellifer, Cameron Pass Campground, 4 Aug 1984, M. E. Barr 6979. UTAH: Pleasant Valley, Aut 1881, S. J. Harkness (holotype); *Thalictrum* sp., Cedar Breaks, Iron Co., 19 Aug 1973, M. E. Barr 6130 (all NY).

The ascospores in these collections have the shape and heavy wall pigmentation of *K. clivensis*, but all of the dimensions are smaller. A number of ascospores seem to be fully mature, with thickened walls, but without a septum or with only a median septum. The species was thought to be undescribed, but Huhndorf (personal communication) discovered that it was identical with *Leptosphaeria utahensis*. The description and figures of ascospores provided by Wehmeyer (1946) for "*Leptosphaeria eustoma* ss. Berl." on *Thalictrum* amd *Aquilegia* from Wyoming are similar to this taxon. Wehmeyer's collections differ from the redefined concept of *Phaeosphaeria eustoma* (Fuckel) L. Holm now utilized (L. Holm 1957, Hedjaroude 1968, Leuchtmann 1985, Shoemaker and Babcock 1989c).

Lautitia was described by Schatz (1984) for *L. danica* (Berlese) Schatz, a biotroph of *Chondrus*.

Metameris includes *Scirrhodothis* and *Scirrhophragma* (von Arx and Müller 1975) and has been synonymized under *Scirrhia* (L. and K. Holm 1978). Earlier I had accepted this arrangement (Barr 1987), but *Scirrhia rimosa* (Alb. & Schwein.: Fr.) Fuckel is dothideaceous and represents a genus of the Dothideales (Barr 1972). On the other hand, the two stromatic species in *Metameris*, known on ferns in the northern hemisphere, have pseudoparaphysate centra and their ascospores show affinities to *Didymella*, much as the affinities of *Rhopographus filicinus* (Fr.) Nitschke in Fuckel are to *Phaeosphaeria*. Both species produce locules grouped in stromatic tissues. *Metameris osmundae* (Peck & Clinton) von Arx & Müller has ascospores with a caplike empty region above the upper cell, within the outer wall, thus not an appendage. Rarely two additional septa are formed above the submedian septum and one below, much as in septum development in species of *Paraphaeosphaeria*. *Metameris aspidiorum* (Lib.) von Arx & Müller has fusoid ascospores whose septum is about median. The species have been described and illustrated by Obrist (1959), Müller and von Arx (1962), L. and K. Holm (1978).

Montagnula is accepted for dictyosporous species with dark brown, verrucose ascospores, typically developing in large monocots. Crivelli (1983) and Leuchtmann (1984) enlarged the concept of the genus. Barr (1990b) recognized three species in North America.

Nodulosphaeria was reviewed with emphasis on North American species by Shoemaker (1984b) and added to by

Shoemaker and Babcock (1987b). A revised key to species known in North America includes some scolecosporous taxa [*N. erythrospora* (Riess in Rabenh.) L. Holm, *N. mathieui* (West.) L. Holm, *N. niesslii* (Baumler) L. Holm], treated by Shoemaker (1976) under *Ophiobolus*, four species not previously recorded for North America, and one previously undescribed species.

1. Ascospores 3-septate, 22-29 x 4.5-5 µm, appendages pulvinate....................................*N. submodesta*
1. Ascospores more than 3-septate........................2
2. Ascospores 4-septate, 26-40 x 4-6 µm, appendages pulvinate...............................*N. modesta*
2. Ascospores more than 4-septate..................3
3. Ascospores 5-septate................................4
3. Ascospores more than 5-septate........................6
4. Ascospores 38-69 x 8-11 µm, appendages pulvinate; ascomata sparsely or short setose..........*N. winteri*
4. Ascospores narrower; setae numerous and conspicuous...5
5. Ascospores 22-30 x 6-7 µm, appendages lacking...*N. revelstokensis*
5. Ascospores 33-48 x 4.5-6.5 µm, appendages pulvinate...*N. aquilana*
6. Ascospores 6-septate, appendages pulvinate.......7
6. Ascospores more than 6-septate.................10
7. Ascomata lacking setae; ascospores 57-70-84 x 3.5-5 µm...*N. olivacea*
7. Ascomata bearing setae; ascospores shorter...........8
8. Ascospores 27.5-31 x 3.5-4.5 µm...*N. novae-angliae*
8. Ascospores larger..............................9
9. Ascospores 35-51.5 x 4-5.5 µm.................*N. aucta*
9. Ascospores 45-53(-60) x 5-7 µm...............*N. ladina*
10. Ascospores 8-10-14-septate, (3-)5-7(-7.5) µm wide; ascomata bearing apical setae...............11
10. Ascospores 11-septate or more, narrow, 1.5-3.5 µm wide; ascoma apex blackened, not setose...........14
11. Ascospores 36-52 x (4-)5-6.5 µm, lacking appendages...*N. dolioloides*
11. Ascospores longer, appendages formed...............12
12. Ascospores 75-92 x (3-)5.5-7 µm, appendages conoid..................................*N. megalospora*
12. Ascospores shorter, appendages conoid..........13
13. Ascospores 53-67 x 5.5-6.5(-7.5) µm.......*N. epilobii*
13. Ascospores 60-80 x (4.5-)5-6 µm.........*N. octoseptata*
14. Ascospores 63-130 x 1.5-3 µm, 5th or 6th cell enlarged..............................*N. erythrospora*
14. Ascospores up to 100 µm long, 4th cell enlarged...15
15. Ascospores appendaged, 69-99 x (1.5-)2.5-3.5 µm...*N. niesslii*
15. Ascospores not appendaged, 77-100 x 2 µm...*N. mathieui*

Nodulosphaeria aucta (Niessl in Rabenh.) L. Holm is known in Europe from *Clematis*, and has 6-septate ascospores with the third cell enlarged, 35-44 x 4-5 µm, and small globose appendages. A collection on *Aquilegia formosa* Fisch. ex DC. (CANADA: BRITISH COLUMBIA: Ridge N of Mimulus Lake, Garibaldi Prov. Park, 2 Aug 1952, M. E. Barr 606h, NY) fits well, although the ascospores range slightly larger, 40-51.5 x 4.5-5.5 µm (Fig. 1p). Because of the close agreement in description and the related host plants, this collection is identified as *N. aucta*.

Nodulosphaeria epilobii (Muller) L. Holm was described from Switzerland on species of *Epilobium*, having 10-(11-) septate ascospores with the fifth cell enlarged, 55-67 x 5.5-6.5 µm, and conoid appendages. A collection on *Epilobium latifolium* L. (CANADA: NEWFOUNDLAND: near Cooks Harbor, 14 Aug 1957, R. T. Wilce 263, NY) fits well with the European collections (Fig. 1q,r). The apical setae are slightly larger, 37-60 x 6-7.5 µm, but ascospores, 53-63 x 6(-7.5) µm and delicate conoid appendages are comparable to *N. epilobii*, larger than in the eight-septate *N. cadubriae* (Speg.) L. Holm.

Nodulosphaeria ladina (Muller) L. Holm, on umbellifers in Europe, has six-septate ascospores, 45-53 x 5.5-7 µm, with the third cell enlarged and pulvinate appendages. Two collections on unidentified umbellifers (USA: COLORADO: Cameron Pass Campground, Roosevelt Nat'l Forest, 4 Aug 1984, M. E. Barr 6978, 7038, NY) agree well with descriptions and figures of this species. The ascospores reach a length of 60 µm in these collections (Fig. 1s).

Nodulosphaeria megalospora (Auersw. & Niessl in Niessl) L. Holm is known from *Sambucus ebulus* L. in Czechoslovakia and has elongate, (10-)12-septate ascospores, 75-92 x 5.5-7 µm, with the sixth cell short and wide. A collection on *Sambucus* sp. (USA: OREGON: near Lost Prairie and Lava Beds, Willamette Nat'l Forest, 16 Aug 1975, M. E. Barr 6282b, NY) fits perfectly except that asci are longer and narrower than Shoemaker (1984b) gave (100-110 x 10-11 µm), ascospores are narrower (80-90 x 3 µm), and additional septa, up to 21, may form, so that the short, almost rounded enlarged cell may be the seventh or eighth cell from the apex (Fig. 1t).

Nodulosphaeria novae-angliae Barr, sp. nov. Fig. 1u,v,w

Asomata immersa globosa 250-350 µm, setae breves, peridia 10-13 µm lata. Asci bitunicati 85-92 x 7.5-9 µm cylindrici. Pseudoparaphyses cellulosae. Ascosporae 27.5-31 x 3.5-4.5 µm flavobrunneae fusoideae cylindricae 6-septatae, cellula tertia aucta, appendices subglobosae 3-3.5 x 2.5-3 µm, biseriatae. Holotypus in *Desmodii* caulibus, "USA: Massachusetts: Franklin Co., Roe, 28 Aug 1961," a M. E. Barr 3113 lectus in Herb. NY depositus.

Ascomata separate or gregarious, subepidermal, globose, 250-350 µm diam; apex short papillate, covered with short setae; peridium blackish brown, 10-13 µm wide, brown hyphae into substrate. Asci 85-92 x 7.5-9 µm, cylindric. Pseudoparaphyses narrowly cellular. Ascospores 27.5-31 x 3.5-4.5 µm, yellowish brown, fusoid cylindric, tapered to obtuse ends, 6-septate, first-formed septum nearly median, constricted, third cell enlarged; appendages subglobose, 3-3.5 x 2.5-3 µm; overlapping biseriate in the ascus.

In stalks of *Desmodium*, known from the type collection.

This species has the smallest ascospores of those with six septa. It is nearest to *N. centaureae* (Müller) L. Holm, with the first-formed septum supramedian and small clavate appendages or *N. franconica* (Petrak) L. Holm with larger ascospores, 35-40 x 5.5-7 µm, the first-formed septum supramedian, and lacking appendages. Shoemaker (1984b) assigned a Canadian collection on *Desmodium canadense* (L.) DC. to *N. submodesta* (Müller) L. Holm, but that species differs from this one in four-septate ascospores whose first-formed septum is supramedian.

Ophiosphaerella is a scolecosporous genus closely related to *Phaeosphaeria*, with a *Scolecosporiella* anamorph. *Ophiosphaerella herpotricha* (Fr.: Fr.) Walker was described and illustrated from numerous grasses (Shoemaker 1976 under *Ophiobolus*, Walker 1980). *Ophiosphaerella korrae* (Walker & Smith) Shoemaker & Babcock is known from Rhode Island (Shoemaker and Babcock 1989c).

Paraphaeosphaeria was described originally (O. Eriksson 1967) for four species whose oblong-cylindric ascospores have a submedian first-formed septum and whose anamorphs are in *Coniothyrium (Microsphaeropsis* for species with phialidic conidiogenesis). Hedjaroude (1969) added one species and Crivelli (1983) enlarged the concept of the genus by including two dictyosporous species. Shoemaker and Babcock (1985) did not accept the dictyosporous species, which are now assigned to *Chaetoplea* (Barr 1990b). Shoemaker and Babcock did accept six phragmosporous species in the genus, only three having Canadian representatives. Two additional combinations are proposed here and two species are described as new in the genus. Huhndorf (1991) adds another species to the genus, *P. concentrica* (Ellis & Everh.) Huhndorf, in apple leaves from Missouri and Louisiana. A key to North American species follows.

1. Ascospores usually two septate........................2
1. Ascospores usually three, four or five septate........5
    2. Ascomata sphaeroid and short papillate; ascospores (12-)16-24 x 4-5(-6) µm; in monocots......*P. michotii*

2. Ascomata globose or sphaeroid; in dicots.........3

3. Ascospores (9-)12-16 x 3.5-4.5 µm; ascomata sphaeroid; in *Lespedeza*..............................*P. microspora*

3. Ascospores mostly longer; ascomata globose, collabent at times..4

4. Ascospores 15.5-22.5 x (3.5-)6.5-8 µm; ascomata collabent with conspicuous short papilla; in *Helianthus*..........................*P. maximiliani*

4. Ascospores (14.5-)16.5-18.7 x (3.6-)4.3-5.7(-6.5) µm; ascomata globose, papilla short; in leaves of *Malus*..............................*P. concentrica*

5. Ascospores usually three septate.....................6

5. Ascospores four or five septate......................7

6. Ascospores 12-14 x 4-5 µm; ascomata separate, surrounded by yellowish brown hyphae forming thin clypeus at surface...................*P. filamentosa*

6. Ascospores 20-25 x 7-8 µm; ascomata gregarious, several included in brown pseudoparenchymatous stromatic mass......................*P. conglomerata*

7. Ascospores usually four septate, 16-19.5 x 5-7 µm; ascomata surrounded by brownish hyphae....*P. quadriseptata*

7. Ascospores usually five septate, (15-)17-24 x 4.5-6.5 µm; ascomata surrounded by pallid hyphae, forming whitish disc at surface....................*P. obtusispora*

Paraphaeosphaeria conglomerata Barr, sp. nov. Fig. 2a,b,c

Stromata immersa erumpentia nigra rotunda (0.1-)1-2 mm lata vel elongata 1-3 x 1-2 mm. Ascomata numerosa globosa vel sphaeroidea vel ovoidea 200-400(-500) µm, apices papillatae, peridia 25 µm lata avellanea. Asci bitunicati 100-130 x 10-12 µm cylindrici. Pseudoparaphyses cellulosae. Ascosporae 20-25 x 7-8 µm flavobrunneae oblongae (1-2-)3-(4-)septatae, septum primum in submedio, peridia verruculosa, uni- vel biseriatae. Holotypus in *Yuccae baccatae* Torrey foliis, "USA: Colorado, La Plata Co., Durango, S facing slopes, Fort Lewis College campus, 11 Oct 1990, a A. W. Ramaley lectus in Herb. NY et UC depositus.

Stromata black, erumpent, rounded, (0.1-)1-2 mm wide, or elongate, 1-3 x 1-2 mm, visible on both leaf surfaces in large gray, brown-margined spots, soft to section, of pseudoparenchymatous cells, marginal region for about 50 µm dark brown, of compact cells, internally light brown cells, extending as interwoven hyphae that surround and penetrate cells of substrate. Ascomata rarely solitary, usually numerous, 200-400(-500) µm diam, globose or somewhat sphaeroid or ovoid when crowded; apex rounded or short papillate to surface, occasionally projecting to 50 µm; peridium soft, of light brown pseudoparenchymatous cells, from surface showing pigment in blotches along walls, ca. 25 µm wide. Asci numerous, 100-130 x 10-12 µm, cylindric. Pseudoparaphyses narrowly cellular, ca. 2 um wide. Ascospores 20-25 x 7-8 µm, yellowish brown, darkening in age, with darker septa, oblong, (1-2-)3-(4-)

septate, first-formed septum submedian, cell above enlarged, second septum delimiting enlarged cell, third septum above this, occasional fourth septum in lower hemispore; wall finely verruculose, surrounded by gel coating; uniseriate or partially biseriate in the ascus.

Presumed anamorph: *Coniothyrium bartholomaei* Dearness & Bartholomew: pycnidia in similar stromata, 200-300 µm or loculate and 400 x 500 µm; conidiogenous cells lining locule, enteroblastic phialidic; conidia dark brown, 5-7.5 µm diam, verruculose. Presumed spermatial state: *Pleurophoma* like: small stromata containing pycnidia, occasionally ascomata in same stromata; conidiophores septate, lining cavity; conidia in mass light bright brown, individually hyaline, oblong, ca. 5 x 1 µm, one celled.

Phragmodothis was erected (Theissen & H. Sydow 1914) for a fungus having erumpent stromata 4-8 mm containing immersed locules 180-220 µm wide by 160-170 µm high, asci 80-95 x 12-16 µm in "atypical paraphyses" described as a paraphysoid layer (Theissen and H. Sydow 1915) and brown, 3-septate ascospores, 20-24 x 5-6 µm. The authors believed that it was mature material of *Dothidea conspicua* Griffiths, in leaves of *Yucca angustifolia* Pursh., cited W. Amer. Fungi 43, and proposed the combination *Phragmodothis conspicua* (Griffiths) Theissen & H. Sydow. In 1915 they added five more species, only one of these, *P. circumscissa* (Tracy & Earle) Theissen & H. Sydow, of interest here.

Petrak (1929) studied material from Brenckle's F. Dakot. 438; he described stromata with locules 180-250 (-300) µm, numerous asci 90-120 x 10-12.5 µm in numerous paraphyses, 3-septate, dark brown ascospores 16-20(-24) x 5-6.5 µm. At this time Petrak decided it was a species of *Thyridaria* and made the combination *T. conspicua* (Griffiths) Petrak. Wehmeyer (1941) did not accept the species in *Thyridaria* and determined that Griffith's fungus was dothideaceous. Petrak (1941) added as synonym *P. circumscissa*, noting that the host was *Yucca gloriosa* L. rather than *Agave*, and that mature ascospores were as Theissen and H. Sydow had given. This species was described as *Plowrightia circumscissa* Tracy & Earle from *?Agave* in Florida, as stromatic with locules, aparaphysate asci and hyaline, one-septate ascospores 20 x 5 µm. Theissen and H. Sydow (1915) stated that the ascospores were immature and that they become olive brown, three-septate and 18-20 x 5-6 µm. Only one specimen labelled *Plowrightia circumscissa* was available at NY; that is not the type but a collection from California and is *Dothidea conspicua*. The species from Florida is not accepted as identical with *"Phragmodothis conspicua"* for circumscissile exposure of smaller stromata, lack of pseudoparaphyses and short, wide asci differ from the western taxon; it could be *Mycosphaerella acervata*, as noted below.

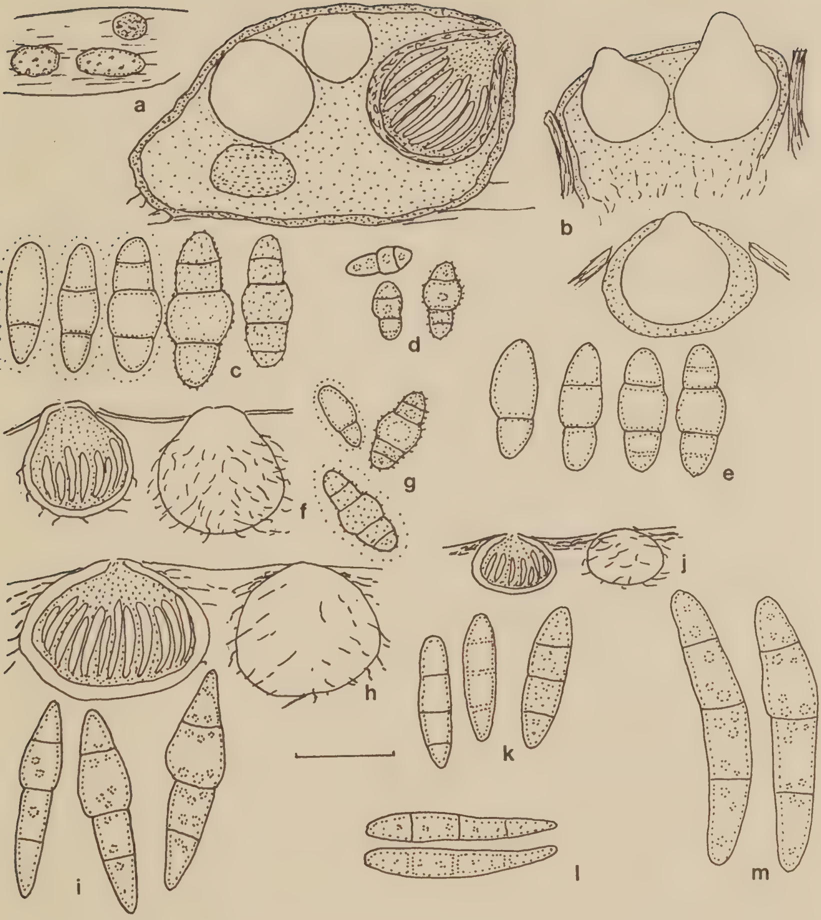

Fig. 2. a, b, c. *Paraphaeosphaeria conglomerata*: a, habit of erumpent stromata, b, stromata in vertical section showing variation in size and numbers of ascomata, c, ascospores. d. *P. filamentosa*, ascospores. e. *P. maximiliani*, ascospores. f, g. *P. quadriseptata*: f, ascomata in vertical section and outline, g, ascospores. h, i. *Phaeosphaeria hesperia*: h, ascomata in vertical section and outline, i, ascospores. j, k. *P. infuscans*: j, ascomata in vertical section and outline, k, ascospores. l. *P. acori*, ascospores. m. *P. scirpicola*, ascospores. Standard line = 150 μm for ascomata, 15 μm for ascospores.

L. Holm (1968) determined that *Dothidea conspicua* was indeed the fungus that Griffiths had described. Barr (1972) also accepted *Dothidea conspicua* within that genus, for the type specimen has small locules (50-90 µm) in small erumpent stromata, short wide asci 55-70(-80) x 12-16(-22) µm in deliquescent pseudoparenchymatous cells, and brown, 1-septate ascospores 14.5-16.5 x 6-7.5 µm. Other collections of this species have ascospores that are invariably one septate in short clavate asci. Copies of Brenckle's F. Dakot. 438 that Barr examined bore species of *Kellermania* and *Coniothyrium*, and *Mycosphaerella acervata* (Ellis & Everh.) Barr, a stromatic species having small locules and hyaline, 1-septate ascospores 14-22 x 3-5 µm.

No specimens referable to *Phragmodothis conspicua* sensu Theissen & H. Sydow had been located until recently. The genus was synonymized under *Plowrightia* by von Arx and Müller (1975) and Eriksson and Hawksworth (1991). Evidently these authors were swayed by Theissen and Sydow's description of 3-septate ascospores in making that assignment, for the type of *Dothidea conspicua* is indeed a species of *Dothidea* and *Phragmodothis* must be relegated to synonymy under *Dothidea* Fr. The descriptions of *Phragmodothis conspicua* (Griffiths) Theissen & H. Sydow, Ann. Mycol. 12: 179. 1914 and *Thyridaria conspicua* (Griffiths) Petrak, Ann. Mycol. 27: 340. 1929 refer to *Paraphaeosphaeria conglomerata*, although the names are synonyms of *Dothidea conspicua* Griffiths.

The collection described above agrees with Theissen and Sydow's and Petrak's descriptions in many respects and makes clear several important points: 1) The fungus is indeed different from *Dothidea conspicua*. 2) The ascomata are gregarious, with a thin but definite wall, embedded in a soft stromatic mass; they are not locules in a stroma. 3) The ascospores are precisely of the type found in species of *Paraphaeosphaeria*, that is, they are oblong with obtuse ends, the first-formed septum is strongly submedian, the cell above this septum is enlarged and two additional septa normally form in the upper hemispore. At times one septum may not develop or a fourth septum may form in the lower hemispore. 4) *Coniothyrium bartholomei* Dearness & Barthomolew is intimately associated in the large gray leaf spot that houses the ascomata.

Paraphaeosphaeria filamentosa (Ellis & Everh.) Barr, comb. nov. Fig. 2d

Leptosphaeria filamentosa Ellis & Everh. J. Mycol. 4: 76. 1888.

Ascomata immersed, separate, in gray spots or dead leaves, visible from surface as small rounded clypeus penetrated by dot of pore, nearly globose, 200-220 µm diam, apex rounded, pore opening to surface; peridium of brown pseudoparenchymatous cells, 10-15 µm wide, surrounded laterally by weft of light yellowish brown hyphae, above condensed to form thin clypeus. Asci 55-70 x 8-10 µm, oblong. Pseudoparaphyses narrowly cellular, gelatinizing. Ascospores 12-14 x 4-5 µm, yellowish brown, oblong, (1-2-)3-septate, first-formed septum nearly median, cell above enlarged, third septum in lower hemispore; wall verruculose, surrounded by narrow gel coating; one globule per cell; overlapping uniseriate to biseriate in the ascus.

In leaves of *Yucca filamentosa* L.

Material examined: USA: NEW JERSEY: Newfield, Gloucester Co., Jul & Aug 1888, J. B. Ellis N.A.F. 2124 as *Diatrype acervata* (NY).

The fungus agrees well with the description and this material could well be part of the original collection. Ellis and Everhart (1892) noted that the "spermogonial stage is a *Coniothyrium (C. concentricum)?* with small (4 µ), subglobose, brown sporidia." Berlese (1892, Tab. XXXIX, f. 7) illustrated *L. filamentosa* from original material sent by Ellis.

Paraphaeosphaeria maximiliani (Ellis & Everh.) Barr, comb. nov. Fig. 2e

Metasphaeria maximiliani Ellis & Everh., Proc. Acad. Nat. Sci. Philadelphia 45: 136. 1893.

Ascomata separate, subepidermal, sphaeroid and often collabent, 350-315 µm wide, 130 µm high; apex short and stoutly papillate, up to 80 µm wide and high; peridium 18-20 µm wide, of blackish brown pseudoparenchymatous cells, brown hyphae into substrate. Asci 60-67 x 12-15 µm. Pseudoparaphyses narrowly cellular. Ascospores 15.5-22.5 x (3.5-)6.5-8 µm, yellowish to yellowish brown, oblong, ends rounded, 2-(3-4-)septate, first-formed septum submedian, constricted, middle cell enlarged; wall smooth.

On *Helianthus maximiliani* Schrad.

Material examined: USA: KANSAS: Rockport, Dec 1892, E. Bartholomew 821 as N.A.F. 2926 (isotype, NY).

This species is close to *P. microspora*, but is larger in all respects. Both species differ from *P. michotii* which has darker brown, verruculose ascospores and develops in monocots.

Paraphaeosphaeria michotii (Westendorp) O. Eriksson

This species is known in the northern hemisphere on grasses and other monocots. Detailed description and synonymy were provided by Shoemaker and O. Eriksson (1967) and Shoemaker and Babcock (1985, 1989c). It was chosen to typify *Paraphaeosphaeria* by O. Eriksson (1967). A collection on *Typha* (USA: MAINE: Ragged Mt., Penobscot Co., 5 Aug 1962, M. E. Barr 3567b, NY) expands the known range of the species.

Paraphaeosphaeria obtusispora (Speg.) Hedjaroude

Hedjaroude (1969) and Shoemaker and Babcock (1985) described and illustrated this species with five-septate ascospores. In addition to *Yucca gloriosa* L. it has been reported from *Agave* and other liliaceous plants. *Smilax* may be added to the listing of host plants (USA: OKLAHOMA: Ripley Bluffs, Payne Co., 16 Aug 1979, M. E. Barr 6730, NY).

Paraphaeosphaeria quadriseptata Barr, sp. nov. Fig. 2f,g

Ascomata immersa globosa 220-330 µm, peridia circa 15 µm lata, badia. Asci bitunicati 76-110 x 11-14 µm oblongi. Pseudoparaphyses cellulosae. Ascosporae 16-20 x 5-7 µm porphyreae oblongae 4-septatae, septum primum in submedio, peridia verruculosa, biseriatae. Holotypus in *Yuccae* foliis, "USA: Arizona: Coconimo Co., Yaki Point, Grand Canyon south rim, 15 Jun 1974," a M. E. Barr 6219 lectus in Herb. NY depositus.

Ascomata separate, immersed, globose, 220-330 µm diam; apex short and wide; peridium ca. 15 µm wide, of chestnut brown pseudoparenchymatous cells, surrounded by ample lighter brown hyphae. Asci 76-110 x 11-14 µm, oblong. Pseudoparaphyses narrow cellular. Ascospores 16-20 x 5-7 µm, dark reddish brown, oblong, ends rounded, 4-septate, first-formed septum submedian, mid cell enlarged, two additional septa in upper hemispore, one in lower hemispore; wall verruculose, surrounded by narrow gel coating; contents with one globule per cell; overlapping biseriate in the ascus.

In leaves of *Yucca* sp.

Additional material examined: USA: NORTH DAKOTA: Medora, 2 Sep 1884, A. B. Seymour, Reliquiae Seymourianae as *Kellermania yuccaegena* E. & E. (NY).

Kellermania yuccaegena Ellis & Everh. and two species of *Microsphaeropsis*, with conidia 5-6.5 µm in large conidiomata, 4-5 µm in smaller conidiomata, are present in the North Dakota collection. *Dothidea conspicua* Griffiths and *Piparthron macrosporum* (Dur.) v. Höhnel were separated from the Arizona material.

Phaeosphaeria has been studied several times since L. Holm (1957) revived the genus: O. Eriksson (1967), Hedjaroude (1969), and Leuchtmann (1984) expounded chiefly on European species. Shoemaker and Babcock (1989c) recognized six subgenera and provided keys, descriptions and illustrations to over 100 species, many of them North American. To this excellent study a few additions and notes are made.

Although Shoemaker and Babcock (1989c) did not accept *P. corallorhizae* (Peck) Barr (in Barr et al. 1986) in the genus, but retained the species in *Leptosphaeria* (Shoemaker 1984a), it does seem to be better disposed in *Phaeosphaeria* than in *Leptosphaeria*.

A collection of a fungus that developed in empty ascomata of *Phylleutypa kalmiae* (Peck) Barr (MAINE: on

Kalmia angustifolia L., Basin Pond, Baxter State Park, 5 Jul 1962, M. E. Barr 3311, NY) fits quite precisely as *P. culmorum* (Auersw. ex Rehm) Leuchtmann, although the substrate is unusual. The Maine collections differs from *P. associata* (Rehm) O. Eriksson, parasitic in *Epichloe*, and from other species associated with other ascomata and described under *Leptosphaeria or Metasphaeria* in the literature.

Phaeosphaeria hesperia Barr, sp. nov. Fig. 2h,i

Ascomata immersa globosa 400-600 µm diametro vel oblonga 300 x 500 µm, peridia 25-35 µm lata brunneae vel apices denigratae. Asci bitunicati 100 x 10 µm cylindrici. Pseudoparaphyses cellulosae. Ascosporae 30-38 x 6-7 µm hyalinae vel avellaneae fusoideae 3-septatae, septum primum in medio, biseriatae vel triseriatae. Holotypus in *Equiseti telimateiae* Ehrh. microphylli vel vaginis vel caulibus aliquando, "Canada, British Columbia, Sidney, 27 May 1990," a M. E. Barr 7180 lectus in Herb. DAOM depositus.

Ascomata separate, immersed, visible as low blackened area on surface, 400-600 µm diam, globose, or 300 x 500 µm, oblong; apex rounded, pore up to 75 µm wide, surrounded by small blackened cells; peridium 25-35 µm wide, of brown pseudoparenchymatous cells, inner layer pallid, up to 50 µm wide basally and laterally in immature ascomata; brown hyphae into substrate. Asci ca. 100 x 10 µm, cylindric. Pseudoparaphyses narrowly cellular, up to 3 um wide. Ascospores 30-38 x 6-7 µm, hyaline becoming light dull brown, elongate fusoid, 3-septate, first-formed septum median, constricted, second cell enlarged, cells about equal in length; wall smooth or faintly verruculose, gel coating not seen; overlapping bi- to triseriate in the ascus.

Stagonospora anamorph associated: conidiomata similar to ascomata, separate or at times two fused; conidiogenous cells lining wall, holoblastic; conidia 40-52 x 1.5-2 µm, hyaline, filiform, delicately 5-septate.

In sheaths and microphylls, occasionally stems of *Equisetum telimateia*.

Additional material examined: CANADA: BRITISH COLUMBIA: Sidney, Coles Bay, 27 June 1990, M. E. Barr 7193 (DAOM).

None of the species of *Phaeosphaeria* known in *Equisetum* is similar to this one, which seems best arranged in subgenus Fusispora. Shoemaker and Babcock (1989c) recognized several taxa having species of *Equisetum* as a host. In subgenus Phaeosphaeria: *P. hiemalis* (Sacc. & Speg. in Sacc.) Shoemaker & Babcock, in *E. hyemale* L., ascospores fusoid, 24-28 x 6-7 µm, 3-(5-) septate. In subgenus Spathispora: *P. equiseti* (Karsten) L. & K. Holm in *E. scirpoides* Michx., ascospores broadly fusoid, 40-50 x 6-7 µm; *P. lindii* (L. & K. Holm) Leuchtmann in *E. variegatum* Schleicher, ascospores oblong, 25-32 x 6-7 µm, 7-septate. In subgenus Vagispora: *P. berlesei* (Larsen & Munk) Hedjaroude, in *E. hyemale*, ascospores narrowly fusoid (oblong), 33-45 x 5-7 µm, 7-(11-)septate; *P. celata* Shoemaker & Babcock in *E. hyemale*, ascospores fusoid, 32-38 x 10-13 µm, 5-septate, echinulate. This last taxon is surely identical with *Chaetomastia equiseti* Barr (Barr 1989a) and is preferably disposed in *Chaetomastia* under Barr's slightly earlier (Mar 1989) name. Additionally, *Leptosphaeria arvensis* Speg., in *E. arvense* L., has elongate fusoid ascospores, 30-35 x 5-6.5 µm, 3-5-septate; ascomata are small, 100-150 µm, and papillate.

Phaeosphaeria infuscans (Ellis & Everh.) Barr, comb. nov.
Fig. 2j,k
Metasphaeria infuscans Ellis & Everh. North Amer. Pyrenomyc. 388. 1892.

Ascomata gregarious, immersed beneath blackened leaf sheaths, 250-300 µm diam, globose; apex plane, pore rounded, ca. 30 µm wide; peridium ca. 20 µm wide, of reddish brown polygonal cells, surrounded by brown hyphae and small-celled stromatic knots. Asci 65-88 x 10-12 µm, oblong. Pseudoparaphyses narrowly cellular. Ascospores (14.5-)18-20 x 3.5-5 µm, light dull yellowish, oblong fusoid, apex obtuse, tapered to acute base, (2-)3-(4-) septate, first-formed septum median, not constricted; wall smooth, delicate gel coating; overlapping biseriate in the ascus.

In *Andropogon virginicus L.*

Material examined: USA: ALABAMA: Auburn, Oct 1891, G. F. Atkinson, N.A.F. 2754 (isotype, NY).

This species seems best accommodated in subgenus Ovispora, although the ascospores are somewhat shorter, wider, and more rounded at the apex than species arranged in that subgenus by Shoemaker and Babcock (1989c).

Phaeosphaeria silenes-acaulis (DeNot.) L. Holm was treated in *Leptosphaeria* by Shoemaker (1984a), although he noted that ascomata were small and thin walled, as they are in *Phaeosphaeria*. The species is known in arctic-alpine North America on *Silene acaulis* L. (Barr 1959 as *Leptosphaeria silenes-acaulis* De Not.) It is a species that has small ascomata, short wide asci and three-septate ascospores, 32-40 x 5-8 µm. L. Holm (1957) remarked on similarities with *P. juncicola* (Rehm) L. Holm and *P. juncina* (Auersw.) L. Holm (in section Fusispora) and with *P. sowerbyii* (Fuckel) L. Holm (in section Sicispora) which has tapered, longer, six-septate ascospores. *Phaeosphaeria acori* (Dearness & House) Barr, comb. nov. Fig. 21 (basionym: *Sphaerulina acori* Dearness & House in House, Bull. New York State Mus. 343-344: 79. 1921) seems to be another related species, and does not belong in *Sphaerulina* as Shoemaker and Babcock (1989c) had it; they provided description and illustrations. Still another species in this group is that described as *Phaeosphaerella scirpicola* Earle, supposedly having one-septate ascospores. A species of *Monascostroma* is also present on the type collection, whose hyaline, one-septate ascospores are smaller and perhaps were taken to represent young stages.

Phaeosphaeria scirpicola (Earle) Barr, comb. nov. Fig. 2m
Phaeosphaerella scirpicola Earle, Bull. New York Bot. Gard. 3: 293. 1905 (separate 1904).

Ascomata immersed, scattered, globose, 65-100 µm, apex obtuse, pore small; peridium of brown pseudoparenchymatous cells, ca. 10 µm wide, darkened toward apex, sparse brown hyphae into substrate. Asci 49-55 x 14.5-16.5 µm, oblong to slightly saccate. Pseudoparaphyses sparse. Ascospores 35-44 x 4.5-5.5 µm, light brown, oblong, scarcely tapered to obtuse ends, 3-septate, not constricted; wall smooth; guttulate; in one or two fascicles in the ascus.

In leaves of *Scirpus*.

Material examined: USA: CALIFORNIA: foothills near Stanford Univ., 1 Jan 1902, C. F. Baker, Pacific Slope F. 212 (holotype, NY).

Phaeosphaeria thomasiana (Sacc. & Roum.) Huhndorf is known on canes of *Rubus* from Oregon (Huhndorf 1991).

Phaeosphaeria vitalbae (DeNot.) Barr, in stems of *Clematis*, was added to the genus (Barr 1990b) in subgenus Vagispora. The ascospores often develop a longitudinal septum in one or more cells.

Rhopographus *filicinus* (Fr.) Nitschke in Fuckel is a stromatic taxon with affinities to *Phaeosphaeria* in ascospore shape and septation. It develops in rachises of *Pteridium aquilinum* L. in the northern hemisphere and was described and illustrated by Obrist (1959) and L. and K. Holm (1978).

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Literature cited

Arx, J. A. von, and E. Müller. 1975. A re-evaluation of the bitunicate Ascomycetes with keys to families and genera. Stud. Mycol. Baarn 9: 1-159.

Barr, M. E. 1959. Northern Pyrenomycetes. I. Canadian eastern arctic. Contr. Inst. Bot. Univ. Montreal 73: 1-100.

-----. 1972. Preliminary studies on the Dothideales in temperate North America. Contr. Univ. Michigan Herb. 9: 523-638.

-----. 1982. *Leptosphaeria sepalorum.* Mycotaxon 15: 345-348.

-----. 1987. Prodromus to Class Loculoascomycetes. Publ. by the author, Amherst, MA 168 p.

-----. 1989a. The genus *Chaetomastia* (Dacampiaceae) in North America. Mycotaxon 34: 507-515.

-----. 1989b. *Clypeosphaeria* and the Clypeosphaeriaceae. Syst. Ascomyc. 8: 1-8.

-----. 1990a. Melanommatales (Loculoascomycetes). N. Amer. Fl. ser. II, 13: 1-129.

-----. 1990b. Some dictyosporous genera and species of Pleosporales in North America. Mem. New York Bot. Gard. 62: 1-92.

-----, and L. Holm. 1984. (729) Proposal to conserve *Nodulosphaeria* and its type (Fungi: Loculoascomycetes). Taxon 33: 109.

-----, and C. T. Rogerson. 1983. Two new species of Loculoascomycetes. Mycotaxon 17: 247-252.

-----, -----, S. J. Smith, and J. H. Haines. 1986. An annotated catalog of the Pyrenomycetes described by Charles H. Peck. New York St. Mus. Bull. 459: 1-74.

Berlese, A. N. 1891. Icones fungorum, Fasc. 1: 29-50.

-----. 1892. Icones fungorum, Fasc. 1: 51-90.

Boise, J. R. 1989. On *Hadrospora*, a new genus in the Phaeosphaeriaceae, and *Byssothecium alpestris* in the Dacampiaceae. Mem. New York Bot. Gard. 49: 308-310.

Carris, L. M., and D. A. Glawe. 1989. Fungi colonizing cysts of *Heterodera glycines*. Illinois Agric. Exp. Sta. Bull. 786: 1-93.

Corbaz, R. 1957. Recherches sur le genre *Didymella* Sacc. Phytopathol. Z. 28: 375-414.

Corlett, M. 1981. *Didymella* and *Didymella*-like species. Canad. J. Bot. 59: 2016-2042.

Crivelli, P. G. 1983. Ueber die heterogene Ascomycetengattung *Pleospora* Rabh.; Vorschlag für eine Aufteilung. Dissert. ETH Zurich 7318: 1-213.

Ellis, J. B., and B. M. Everhart. 1892. The North American Pyrenomycetes. Published by the authors, Newfield, NJ. 793 p.

Eriksson, O. 1967. On graminicolous pyrenomycetes from Fennoscandia I, II, III. Ark. Bot. ser. 2, 6: 339-466.

-----, and D. L. Hawksworth. 1991. Outline of the ascomycetes - 1990. Syst. Ascomyc. 9: 39-271.

Hawksworth, D. L. 1985. *Kirschsteiniothelia*, a new genus for the *Microthelia incrustans*-group (Dothideales). Bot. J. Linn. Soc. 91: 181-202.

Hedjaroude, G.-A. 1969. Études taxonomiques sur les *Phaeosphaeria* Miyake et leurs formes voisines (Ascomycètes). Sydowia 22: 57-107.

von Höhnel, F. 1917. Fragmente zur Mykologie. 1042. Über *Sphaeria hirta* Fries. Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Kl. Abt. 1, 126: 369-371.

-----. 1920. Fragmente zur Mykologie. 1210. Über *Cladosphaeria sambuci racemosae* Otth. Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Kl. Abt. 1, 129: 170-171.

-----. 1923. Fragmente zur Mykologie. 1217. Über die Gattung *Clypeosphaeria* Fuckel. Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Kl. Abt. 1, 132: 95-97.

Holm, L. 1957. Études taxonomiques sur les Pléosporacées. Symb. Bot. Upsal. 14(3): 1-188.

-----. 1968. Taxonomic notes on Ascomycetes VI. On the genus *Gibberidea* Fuck. and some alleged relatives. Svensk Bot. Tidskr. 62: 217-242.

-----, and K. Holm. 1978. Some pteridicolous Ascomycetes. Bot. Not. 131: 97-115.

Huhndorf, S. M. 1991. The systematics of *Leptosphaeria* species found on the Rosaceae. Bull. Nat. Hist. Surv. Illinois 34: in press.

Leuchtmann, A. 1984. Über *Phaeosphaeria* Miyake und andere bitunicate Ascomyceten mit mehrfach querseptierten Ascosporen. Sydowia 37: 75-194.

Lindau, G. 1897. Pyrenomycetineae. In A. Engler and K. Prantl, Naturl. Pflanzenfam. 1(1): 321-505.

Müller, E. 1958. Pilze aus des Himalaya II. Sydowia 12: 160-184.

-----, and J. A. von Arx. 1962. Die Gattungen der didymosporen Pyrenomycetes. Beitr. Kryptogamenfl. Schweiz 11(2): 1-922.

Munk, A. 1953. The system of the Pyrenomycetes. Dansk Bot. Ark. 15(2): 1-163.

-----. 1957. Danish Pyrenomycetes. Dansk Bot. Ark. 17(1): 1-491.

Niessl, G. 1872. Beitrage zur Kenntniss der Pilze. Beschreibung neuer und wenig bekannter Pilze. Verh. Naturf. Vereins Brünn 10: 153-217.

Obrist, W. 1959. Untersuchungen über einige "Dothideale" Gattungen. Phytopathol. Z. 35: 357-388.

Petrak, F. 1929. Mykologische Notizen X. Ann. Mycol. 27: 324-410.

-----. 1941. Mykologische Notizen XIV. Ann. Mycol. 39: 251-439.

Punithaligam, E. 1980. *Leptosphaeria coniothyrium*. CMI Descr. Pathol. Fungi & Bacteria n. 662.

Rabenhorst, G. L. 1858. Klotzschii herbarium vivum mycologicum... Ed. 2, n. 725.

Schatz, S. 1984. The life history, developmental morphology, and taxonomy of *Lautitia danica* gen. nov., comb. nov. Canad. J. Bot. 62: 28-32.

Scheinpflug, H. 1958. Untersuchungen über die Gattung *Didymosphaeria* Fuck. und einige verwandte Gattungen. Schweiz. Bot. Gesell. Ber. 68: 325-385.

Shoemaker, R. A. 1976. Canadian and some extralimital *Ophiobolus* species. Canad. J. Bot. 54: 2365-2404.

-----. 1984a. Canadian and some extralimital *Leptosphaeria* species. Canad. J. Bot. 62: 2688-2729.

-----. 1984b. Canadian and some extralimital *Nodulosphaeria* and *Entodesmium* species. Canad. J. Bot. 62: 2730-2753.

----, and C. E. Babcock. 1985. Canadian and some extralimital *Paraphaeosphaeria* species. Canad. J. Bot. 63: 1284-1291.

-----, and -----. 1987a. *Wettsteinina.* Canad. J. Bot. 65: 373-405.

-----, and -----. 1987b. Additions to *Nodulosphaeria.* Canad. J. Bot. 65: 1921-1926.

-----, and -----. 1989a. *Bricookea barrae* n. sp. compared with *Bricookea sepalorum.* Stud. Mycol. 31: 165-169.

-----, and -----. 1989b. *Diadema.* Canad. J. Bot. 67: 1349-1355.

-----, and -----. 1989c. *Phaeosphaeria.* Canad. J. Bot. 67: 1500-1599.

-----, and O. Eriksson. 1967. *Paraphaeosphaeria michotii.* Canad. J. Bot. 45: 1605-1608.

Sivanesan, A. 1984. The bitunicate Ascomycetes and their anamorphs. J. Cramer, Vaduz. 701 p.

Theissen, F., and H. Sydow. 1914. Dothideazeen-Studien. Ann. Mycol. 12: 176-194.

-----, and -----. 1915. Die Dothideales. Ann. Mycol. 13: 149-746.

Walker, J. 1980. *Gaeumannomyces, Linocarpon, Ophiobolus* and several other genera of scolecospored ascomycetes and *Phialophora* conidial states, with a note on hyphopodia. Mycotaxon 11: 1-129.

Wehmeyer, L. E. 1941. The genus *Thyridaria* (Pyrenomycetes). Lloydia 4: 241-261.

-----. 1946. Studies on some fungi of northwestern Wyoming III. *Pleospora* and *Leptosphaeria.* Lloydia 9: 203-240.

Winter, G. 1885. Pilze: Ascomyceten. In Rabenhorst, Kryptogamen Flora von Deutschland, Oesterreich und der Schweiz. 1(2): 65-528.

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SYSTEMATIC AND BIOLOGICAL STUDIES IN THE BALANSIEAE AND RELATED ANAMORPHS. I. PROLOGUE

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ABSTRACT

The current state of knowledge of the tribe Balansieae [Ascomycetes, Clavicipitales, Clavicipitaceae] and related anamorphic endophytes occurring in grasses is briefly reviewed. Areas for future research on the systematics, host/fungal relationships, life history, and biology of the group are identified and discussed. Comments on evolutionary history and speciation are offered.

INTRODUCTION

In recent years, renewed interest has been generated in fungi classified in the tribe Balansieae and related anamorphs that occur in grasses as symptomless endophytes or as epiphytes. Acquisition of additional knowledge on their biology and realization of the considerable impact made on their hosts has led to increased research activity. The Balansieae is one of three tribes classified within the ascomycete subfamily Clavicipitoideae [Clavicipitaceae]. The others are Clavicipiteae and Ustilaginoideae. Infection by such fungi brings about significant changes in host reproductive capacity, deterrence of insect and mammalian herbivores, and plant growth. Colonized grasses are, in many cases, rendered sterile as a consequence of infection by members of the Balansieae and development of teleomorph stromata during the flowering season (Sampson, 1933; Diehl, 1950; Clay, 1986a). Others are variously affected, depending upon the biology of the fungus involved. Infection by solely endophytic anamorphs, in contrast, although they have a similar intercellular growth habit to many teleomorphic Balansieae, does not adversely affect their hosts in this

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way and such fungi are maternally transmitted in host seed (Siegel *et al.*, 1985). They are essentially benign, symptomless endophytes, although their presence undoubtedly results in some energy loss to their host grasses. Some species, such as *Atkinsonella hypoxylon* (Peck) Diehl and *Epichloe typhina* (Pers.:Fr.) Tul., produce perithecial stromata, but can also be seed transmitted (Clay and Jones, 1984; White *et al.*, 1991). The latter forms stromata on some grasses, causing a so-called "choke disease", whereas on others none are formed and the fungus is seed transmitted (White *et al.*, loc. cit.). Grasses infected by members of the Balansieae have been shown to be resistant to damage by insects due, in part, to the production of alkaloids by their fungal associates (Clay *et al.*, 1985; Hardy *et al.*, 1986; Siegel *et al.*, 1985). Unfortunately, however, alkaloids responsible for increased hardiness of host grasses, cause toxicosis in cattle and other mammalian herbivores (Bacon *et al.*,1975; Fletcher and Harvey, 1981; Lyons *et al.*, 1986). Tall fescue toxicosis, and perennial ryegrass staggers, caused by consumption of *Festuca arundinacea* Schreb. infected by *Acremonium coenophialum* Morgan-Jones & W. Gams, and *Lolium perenne* L. containing *A. lolii* Latch, Christensen & Samuels, respectively, are examples of this (Siegel *et al.*, 1985). A number of studies have shown that presence of fungal endophytes belonging to this complex induces enhanced vegetative growth and tillering of grasses (Bradshaw, 1959; Harberd, 1961; Clay, 1984). There is, therefore, a mutualistic association between host grasses and some of their balansian endophytes.

The recent discovery and description of a number of anamorphic fungal endophytes of grasses (Morgan-Jones and Gams, 1982; Latch *et al.*, 1984; White *et al.*, 1987; White and Morgan-Jones 1987a, 1987c; Gams *et al.*, 1990; Morgan-Jones *et al.*, 1990), all thought to have phylogenetic affinity to the Balansieae, have contributed to renewed interest in the biology and systematics of the group. The widespread occurrence of these fungi in the Poaceae (White, 1987) and their specialized, mutualistic relationships with their hosts have stimulated an effort to increase knowledge of their characteristics and investigation of their phylogenetic affinities. The coevolutionary relationships of Balansieae and their host grasses have recently been discussed (White and Morgan-Jones, 1992) and the view expressed that a correlation probably exists between host advancement and balansian peculiarities, in a similar fashion to that between rusts [Uredinales] and their hosts (Savile, 1987). Within the Balansieae, specific adaptive changes in host-fungus relationships, physiological capabilities, and life cycle characteristics, are evident and appear to correlate with chronology of origin. A progressive trend from an epiphytic to an endophytic habit, and from destructive phytopathogenicity to mutualism, is apparent. Modifications in endophyte/host relationships are reflected in morphological changes and frequently involve reduction of life cycles and adaptive changes in physiological capacities.

Since the monograph by Diehl (1950), little study of the systematics of the group has been undertaken, although occasional descriptions of individual species, such as those of *Atkinsonella hypoxylon* and *A. texensis* (Diehl) Leuchtmann & Clay by Leuchtmann and Clay (1989) and Morgan-Jones and White (1989) and of *Myriogenospora atramentosa* (Berk. & Curt.) Diehl by Hanlin and Tortolero (1990), have been published. Until recently, fungal-host interactions of most species have been inadequately understood. The realization that some, such as *Atkinsonella hypoxylon*, *Balansia cyperi* Edg., and *Myriogenospora atramentosa*, are entirely epiphytic, rather than endophytic, in habit (Rykard *et al.*, 1985; Leuchtmann and Clay, 1988) points to a need for additional study of all host-pathogen interfaces among the various members of the Balansieae not looked at closely hitherto. During the past decade, the status of such genera as *Atkinsonella* Diehl and *Balansiopsis* Höhn. has been questioned, particularly whether nor not they should be retained as separate entities from *Balansia* Speg. (Rykard *et al.*, 1984). Within some genera, including *Epichloe* (Fr.) Tul., species concepts are rather ill-defined and are in need of reevaluation. Information on macroconidial and microconidial (spermatial) synanamorphs in the life cycles of genera of the Balansieae is incomplete, as is knowledge of occurrence and the nature and identity of all related anamorphic endophytes.

BRIEF HISTORY OF THE BALANSIEAE

The genus *Balansia* Speg. was established by Spegazzini (1885), who recognized its affinity to *Claviceps* Tul. Lindau (1897) classified *Balansia* in the Hypocreaceae, in his subfamily Clavicipiteae. Von Hohnel (1910) recognized the Clavicipiteae as part of the Hypocreaceae and included his new genus, *Balansiopsis* Höhn., in it. Gaumann (1926) also accepted this classification but recognized three groups within the subfamily: *Oomyces-Ascopolyporus*, *Epichloe-Claviceps*, and *Cordyceps*. Nannfeldt (1932), however, removed the subfamily from the Hypocreales, elevating it to separate familial and ordinal level as Clavicipitaceae and Clavicipitales. Diehl (1950) accepted the groups recognized by Gaumann and designated them as subfamilies within the Clavicipitaceae; Oomycetoideae, Clavicipitoideae, and Cordyciptioideae. He divided the subfamily Clavicipitoideae into three tribes, mentioned above, namely Clavicipiteae, Balansieae [as Balansiae] and Ustilaginoideae. The Clavicipiteae included only *Claviceps*, whereas four genera, *Atkinsonella*, *Balansia*, *Balansiopsis* and *Epichloe*, were classified in the Balansieae. The Usilaginoideae included two genera, *Munkia* Speg. and *Ustilaginoidea* Bref. Luttrell and Bacon (1977) added *Myriogenospora* Atk. to the Balansieae. Rykard *et al.* (1985) noted that these subfamily and tribe names were not validly published [they carried no Latin diagnoses, a requirement for valid publication after January 1, 1935, under Article 36 of the International Code of Botanical Nomenclature] and expressed the view that they were of doubtful usefulness. The spelling of the tribe Balansiae was corrected to Balansieae by Leuchtmann and Clay (1989). As pointed out by Hawskworth (1974), ranks of subfamily and tribe are rarely employed in fungal classification except in large families such as the Agaricaceae. A case can, therefore, be made for reconsideration of the need for continued recognition of tribe names within the Clavicipitoideae since they accommodate, in total, only eight genera [including *Myriogenospora*]. Three of those genera, *Atkinsonella*, *Balansia* and *Balansiopsis*, may not, as mentioned above, be sufficiently different to warrant separate recognition. At present, there are differing opinions concerning their status [see Rykard *et al.* (1984), Leuchtmann and Clay (1989), Morgan-Jones and White (1989)]. These, together with *Epichloe* and *Myriogenospora*, appear to be more closely related to each other than to those classified in the other tribes of the Clavicipitoideae. Because of this, maintenance of taxonomic groups at the tribe rank may be justified. It can certainly be argued that, although only a relatively small number of genera are involved, these fungi constitute a special case because of their varying and unique association with their hosts.

Diehl (1950) distinguished the tribes within the Clavicipitoideae on the basis of anamorph morphology. In the Clavicipiteae, glutinous masses of microconidia are produced from phialidic, obclavate conidiogenous cells arranged in a dense, convoluted palisade. Conidia in the Balansieae are of two types. Dry microconidia produced from elongate, *Acremonium*-like conidiogenous cells and narrowly cylindrical, often scolecosporous macroconidia produced holoblastically on sympodial conidiogenous cells. The generic name *Ephelis* Fr. is based on the latter anamorph. The Ustilaginoideae is characterized by possession of smut-like conidia borne on closely packed parallel hyphae. In addition to these differences, as recognized by Rykard *et al.* (1985), the Balansieae are unlike the Clavicipiteae in their parasitism. Species of *Claviceps*, including *C. paspali* Stevens & Hall on dallisgrass [*Paspalum dilatatum* Poir.] and *C. purpurea* (Fr.:Fr.) Tul., the cause of ergot of a variety of grasses and cereals, show characteristic, very localized infection of grass ovaries [see Gröger, 1972; Luttrell, 1977; 1980] and form highly distinctive sclerotia. These taxa infect by penetration of germ tubes between stigmas or styles of their hosts. In contrast, members of the Balansieae generally cause systemic infection of grasses and sedges although there is considerable variation in their habit. In some, such as *Balansia aristidae* (Atk.) Diehl, *B. epichloe* (Weese) Diehl, and *Epichloe typhina*, systemic, nonhaustoriate, intercellular mycelium occurs endophytically in culm and/or leaf tissues, whereas in others, as in the epiphytic *Atkinsonella hypoxylon* and *Balansia cyperi*, colonization is more localized around meristems, young leaves and inflorescences (Leuchtmann and Clay, 1988). An exception to the normal host-pathogen relationship in *Claviceps* was reported by Walker (1970) in an unusual species occurring on *Phalaris aquatica* L. [as *Phalaris tuberosa* L.] in Australia. It was found to be a systemic endophyte. Leuchtmann and Clay (1988) suggested that this could represent a transitional form between the Clavicipiteae and the Balansieae.

The studies on Balansieae by Diehl (1950), and the taxonomic treatment contained therein, were predominantly based on the morphology of the conidial and perithecial stromata on infected grasses, although some brief consideration was given to other aspects of their biology, including mode of infection and dissemination. During the past decade and a half, increased knowledge of these fungi has been generated in several areas. Studies by Luttrell and Bacon (1977), Rykard *et al.* (1985), and Leuchtmann and Clay (1988), alluded to above, documented the unique epiphytic relationships between *Atkinsonella hypoxylon*, *Balansia cyperi*, and *Myriogenospora atramentosa* and their host grasses. Rykard *et al.* (1985) also reported upon the host relationship of *Balansia epichloe*. The morphology of the ephelidial conidiomata and conidiogenesis in the Clavicipitoideae were investigated by Rykard *et al.* (1982, 1984) and an account of the *Acremonium* anamorph of *Epichloe typhina* [*Acremonium typhinum* Morgan-Jones and W. Gams] *in vivo* was published by White and Morgan-Jones (1987b). Over the years, because of the choke disease of the various forage and wild grasses that it causes, *Epichloe typhina* has been quite extensively studied [see, for example, Sampson, 1933; Bradshaw, 1959; Western and Cavett, 1959; Kirby, 1961; and Kohlmeyer and Kohlmeyer, 1974]. Accounts of ascocarp centrum development in *Epichloe cinerea* Berk. & Br., and *E. typhina* were published by Mhaskar and Rao (1976) and Doguet (1960), respectively.

FURTHER COMMENTS ON THE BALANSIEAE

Although, as indicated above, the most comprehensive study of the Balansieae published to date is that of Diehl (1950), his account of the tribe was restricted in several respects. Firstly, it was based on species collected in North and South America, with no consideration given to taxa occurring elsewhere. Secondly, no account of the genus *Epichloe*, nor of *Myriogenospora*, then not recognized as belonging to the Balansieae, was included. Some aspects of the biology of the fungi, such as the precise interrelationships between them and their hosts, and detailed particulars of primary and secondary stromatal development, were given secondary importance to description of the various taxa and consideration of nomenclature, typification and pathology. In some instances, knowledge of the life cycles of individual species was incomplete as, for example, in *Balansiopsis pilulaeformis* (Berk. & Curt.) Diehl, where an ephelidial macroconidial anamorph was not known to exist. The discovery by Rykard *et al.* (1984) of an *Ephelis* state in the life cycle of this species brings into question the status of this genus, one of whose distinguishing characteristics was believed to be lack of conidial fructifications. Whether or not its type species, *Balansiopsis gaduae* (Rehm) Höhn., forms *Ephelis* conidia remains unknown. In another example, the binomial *Balansia hemicrypta* Diehl was established even though no mature perithecia containing asci were ever observed in the fungus on which it is based. An associated *Ephelis* state was, however, described.

Genera of the Balansieae, as accepted by Diehl (1950), are, in part, or mainly, distinguished by the presence or absence of microconidial [*Acremonium*-like] and macroconidial [Ephelis] anamorphs. *Epichloe* has only microconidia, whereas *Balansia* and *Myriogenospora* have only macroconidia. *Atkinsonella* has both and *Balansiopsis* is presumed to have none, although, as noted above, one species classified in that genus is now known to have an *Ephelis* anamorph. The form-genus *Ephelis* has as its type species *E. mexicana* Fr., but it is uncertain whether this binomial is based upon the anamorph of *Balansia claviceps* Speg. or of *B. obtecta* Diehl. Binomials in *Ephelis* have been established for several other species, including *Balansia cyperi* and *Atkinsonella hypoxylon* [*E. texensis* Ell. & Everh. and *E. borealis* Ell. & Everh., respectively], but not for others such as *B. aristidae* and *B. epichloe*. In at least one species of *Balansia*, *B. cyperacearum* (Berk. & Curt.) Diehl, no *Ephelis* state has been observed (Diehl, 1950), although it seems likely that the fungus produces such an anamorph. *Ephelis* anamorphs, in which conidia are produced holoblastically from micronematous, sympodial conidiogenous cells borne in dense palisades (Rykard *et al.*, 1984; Morgan-Jones and White, 1989), are known to be frequently ephemeral and have very variable fructifications (Diehl, 1950; Ullasa, 1969; Rykard *et al.*, 1984). In *Balansia epichloe*, for example, *Ephelis* conidiogenous cells are borne on thin, rudimentary, white, hyphal mats, whereas in *B. aristidae* and *B. strangulans* (Mont.) Diehl they are produced on relatively well-differentiated, pale brown primary stromata. This part of the life cycle in many species is inadequately known and few *in vitro* studies have been conducted. In India, *Ephelis* anamorphs are known to be formed independently of stromata, occurring superficially on leaves of various grasses and inducing so-called silver leaf disease (Govindu and Thirumalachar, 1961). The role of *Ephelis* conidia in nature is assumed to be propagative. Diehl (1950) used characteristics of *Ephelis* conidiomata to distinguish two subgenera of *Balansia*: *Eubalansia*, with cupulate fructifications, and *Dothichloe*, with effuse to hysteriform fructifications. The usefulness of such subgeneric categorization seems questionable.

The taxonomic status of a number of species placed in both *Balansia* and *Epichloe* is presently uncertain. In the case of the latter, many of the species described in it, or transferred to it, have been removed elsewhere. Such fungi as *Balansia strangulans* and *Myriogenospora atramentosa* were at one time classified in *Epichloe* [as *E. strangulans* (Mont.) Sacc. and *E. atramentosa* (Berk. & Curt.) Cooke, respectively]. Known characteristics of others indicate that they also may be misplaced. *Epichloe volksenii* P. Henn., an African species, for example, was considered by Diehl (1950) to be a *Balansia* but was not reclassified. *Epichloe bertonii* Speg., the only species described from a host other than grasses and sedges, needs reevaluation. Reported by Spegazzini (1922) from Paraguay on stems of *Mikania scandens* (L.) Wild., a member of the Compositae, it produces stromata similar to those of *E. typhina* but is not known to have an anamorph (Diehl, 1950). Similarly, other species, such as *E. bambusae* Pat., and *E. cinerea* Berk. & Br., need to be studied further. The latter, which colonizes the infloresences of *Sporobolus indicus* (L.) Br. [= *Sporobolus poiretii* (Roem. & Schult.) Hitchc.] and other grasses, produces brown to black stromata (Mhaskar and Rao, 1976). It also has no reported anamorph. Within *Balansia*, several taxa have not been fully characterized and there appears to be need for further refining of species concepts. *Balansia aristidae*, for example, which occurs on species of *Aristida* L. in the southeastern United States, is quite similar to *B. strangulans*, which has been reported mainly on species of *Panicum* L. Their *Ephelis* anamorphs are, according to Diehl (1950), indistinguishable, although more ephemeral in the former. The main distinction between the two lies in the presence of more prominent perithecia, with pronounced ostiolar beaks, in *B. aristidae*. Those of *B. strangulans* are more immersed in the ascostroma and, thereby, less clearly discernible in surface view. A complex of forms exists here. *Balansia subnodosa* Atk. is also close to *B. strangulans*, differing from it in forming a ring of discoid ascostromata over a comparatively thin primary stroma or hypothallus, rather than a continuous ascostroma. *Balansia strangulans* forma *discoidea* (P. Henn.) Diehl [≡ *Balansia discoidea* P. Henn.] is similarly different in that the ascostromata do not develop uniformly but occur as separate, often more or less discoid stromata over the primary stromata with sterile areas in between. In some cases, as in *B. cyperacearum*, it is unclear, because of limited collections and variability, how many taxa should be recognized. That species is also known in various forms, on both culms and leaves of Cyperaceae. When on leaves, it somewhat resembles *B. henningsiana* (Moell.) Diehl, whereas on culms it is similar in appearance to *B. strangulans*, with encircling stromata. It may, as presently understood, be a composite species. The need for further critical studies before many species of the Balansieae can be adequately characterized is well illustrated in recent work on *Atkinsonella hypoxylon* and *A. texensis* (Leuchtmann and Clay, 1989; Morgan-

Jones & White, 1989). Before this, the latter was classified as a variety of the former. Although superficially similar in ascostroma morphology and host relationship, these entities were shown to differ sufficiently to warrant separation at the species level. Distinguishing differences included host association (specificity), stroma size, *Ephelis* anamorph conidiomatal morphology, and growth rates and colony characteristics *in vitro*.

MICROCONIDIAL ANAMORPHS

The microconidial *Acremonium* states of *Epichloe typhina* and the two known species of *Atkinsonella*, *A. hypoxylon* and *A. texensis*, have been described from nature as well as in culture (Leuchtmann and Clay, 1989; White and Morgan-Jones, 1987b; Morgan-Jones and White 1989). In *E. typhina*, primary stromata on host plants become covered by a palisade of aculeolate conidiogenous cells and sterile receptive hyphae. The role of microconidia, functioning as spermatia, and the heterothallic nature of the mating systems of *Epichloe typhina*, *Atkinsonella hypoxylon* and *A. texensis*, were reported by White and Bultman (1987), Leuchtmann and Clay (1989), and Morgan-Jones and White (1989), respectively. The condition of other members of the Balansieae in this regard is not known but, given that an *Acremonium* anamorph is absent from the life cycles in the other genera, it is unlikely that such a system remains extant, and species of *Balansia* may be homothallic. It should be noted, however, that Diehl (1950) reported *Typhodium*-like conidia (i.e. *Acremonium*-like microconidia) to be produced from a layer of conidiophores borne on ascostromata in *Balansia strangulans* under humid conditions.

Acremonium typhinum and *A. coenophialum*, a closely similar species not known to produce a teleomorph, were classified by Morgan-Jones and Gams (1982) in a new section, *Albo-lanosa* Morgan-Jones and W. Gams, of *Acremonium* Link. In so doing, no claim of close relatedness to other members of the genus was made. It is recognized that *Acremonium*, as presently constituted, is a heterogeneous entity containing anamorphs of a number of unrelated ascomycete genera, including *Nectria* (Fr.) Fr. and *Thielavia* Zopf, as well as *Epichloe* and numerous microconidial states of unknown phylogenetic affinity. Microconidial synanamorphs of *Botryotrichum* Sacc. & March., *Humicola* Traaen, and *Trichocladium* Harz., are also *Acremonium*-like, as are the anamorphs of *Emericellopsis* van Beyma, and *Cordyceps* (Fr.) Link and *Torrubiella* Boud., two members of the Clavicipitaceae [subfamily Cordycipitoideae (Diehl, 1950)]. The latter are classified in *Verticillium* Nees, section *Prostrata* W. Gams (Gams, 1971). The characteristics of members of that section, particularly colony appearance *in vitro*, are not dissimilar to those of section *Albo-lanosa* (Morgan-Jones *et al.*, 1990). *Acremonium chilense* Morgan-Jones, White & Piontelli, an endophyte of *Dactylis glomerata* L., classified in section *Albo-lanosa*, is considered intermediate between the two sections. A rational, phylogenetically-based, classification of these anamorphs is difficult to achieve since many morphologically similar entities exist, some belonging to unrelated genera, others of doubtful affinity because of absence of a teleomorph. In the case of microconidial states of the Balansieae and, particularly, endophytic anamorphs thought to be related to them, the option of an alternative classification should, perhaps, be considered. The generic name *Typhodium* Link has, in the past, been applied to the anamorph of *Epichloe*. Its use cannot, however, be reactivated because of the impossibility of typification. Link's meager description of it suggests a stage in stromatic development where immature perithecia are present (Diehl, 1950). It is therefore best disposed as a synonym of *Epichloe* (Morgan-Jones and White, 1989). Use of another form-genus, *Sphacelia* Lév., based on *S. segetum* Lev., the anamorph of *Claviceps purpurea*, for the microconidial anamorphs of *Atkinsonella* and *Epichloe* has also occurred [see, for example, Rykard *et al.*, 1984; Leuchtmann and Clay, 1989]. This resulted from the naming of the anamorph of *E. typhina*, *Sphacelia typhina* Sacc. (Saccardo, 1881). Uncertainty exists, however, that Saccardo based this binomial on the true anamorph of *E. typhina* (Morgan-Jones and Gams, 1982; White and Morgan-Jones, 1987b) and reasons against the use of *Sphacelia* for these anamorphs have been advanced (Morgan-Jones and White, 1989). In light of current knowledge, the establishment of a new form-genus to accommodate the microconidial anamorphs of *Atkinsonella* and *Epichloe*, together with related endophytic anamorphs currently classified in *Acremonium* section *Albo-lanosa*, could, perhaps, be justified. A deterrent to such a nomenclatural solution, however, is the fact that binomials such as *Acremonium coenophialum* and *A. lolii* Latch, Christensen & Samuels have been, and continue to be, in widespread use. Apart from making the current classification less artificial it seems that little would be gained by such a change.

At present, eight anamorph endophytes are accommodated in *Acremonium* section *Albo-lanosa*. These include, in addition to those already mentioned, *A. chisosum* White & Morgan-Jones, *A. huerfanum* White, Cole & Morgan-Jones, *A. starrii* White & Morgan-Jones, and *A. uncinatum* W. Gams, Petrini & Schmidt. None, with the exception of *A. typhinum*, are known to produce conidiomata on their host plants and are, as mentioned above, transmitted maternally in the ovules of infected plants. In addition, the microconidial anamorphs of *Atkinsonella hypoxylon* and *A. texensis*, as already indicated, are *Acremonium*-like, but no binomials have been established for them. In both those species, conidiomata are produced *in vivo* and transmission is believed to be achieved horizontally, external to host tissues, by spores (ascospores and/or conidia). Vertical transmission has, however, been documented to occur in *A. hypoxylon* by cleistogamous seeds of *Danthonia spicata* (L.) Beauv. (Clay and Jones, 1984).

The usefulness of the designation of individual taxa within this complex has been questioned in light of difficulty encountered in assigning names to a range of isolates from various woodland grasses (Clay and Leuchtmann, 1989). Variability among isolates in culture also, understandably, contributes to lack of confidence in the established taxonomy [see Christensen *et al.* (1991)]. Because of the morphological simplicity of the microconidial isolates, and given variability, species characterization is certainly problematic and there may well be, in some instances, intergrading forms or a continuum. Ultimately, only critical examination of a wide range of endophytes, including consideration of their total biology, host associations, and characteristics *in vitro*, will resolve some of the difficulties encountered in achieving a satisfactory classification. Determination of phylogenetic relationships by analysis of molecular sequence data will also contribute appreciably to the refining of grass endophyte systematics. Nucleic acid sequence comparisons, that provide direct indication of relative genetic distance, will aid in better understanding relatedness within this complex. Both microconidial and macroconidial anamorphs of different species of the Balansieae can be almost identical, but discernible, monothetic differences, such as in conidium shape, though small, often accurately reflect phylogenetic divergence. When considering conidium shape among microconidial anamorphs classified in *Acremonium* sect. *Albo-lanosa*, two main types can be recognized. Microconidial anamorphs of *Atkinsonella hypoxylon* and *A. texensis*, and *Acremonium chilense* and *Acremonium chisosum*, differ from the other currently recognized taxa in producing ellipsoid or oblong, symmetrical conidia. The *Acremonium*-like microconidia of the two *Atkinsonella* species, which are ellipsoid to ovoid in shape, are closely similar to each other, whereas those of *A. chilense* are distinctive in being oblong. *Acremonium uncinatum* conidia are unique in being filiform and, as indicated by the specific epithet, uncinate. There is little question that these five taxa are clearly separate entities and warrant recognition at species rank. Conidia of the remaining described anamorphs, including *A. coenophialum, A. huerfanum, A. lolii, A. starrii* and *A. typhinum*, are allantoid to navicular and asymmetrical, inequilateral. Within this latter group, species concepts have been based mainly on relatively small differences in conidium and conidiophore morphology, conidial size, and colony characteristics *in vitro* [see White and Morgan-Jones (1987c)]. These differences are similar in degree to those distinguishing many species classified in other sections of the genus *Acremonium* [see Gams (1971)]. Whether the recognized taxa should be considered as anamorphic semi-species [see Burnett (1983)] of a single taxon and be designated at an infraspecific level, possibly as varieties or *formae speciales*, or should be maintained separately, remains debatable. Evidence exists of sexual isolation between two species of the inequilateral conidial group (Schardl and Siegel, 1991). Crosses of two isolates of *A. coenophialum* derived from tall fescue [*Festuca arundinacea*] with *E. epichloe* from *Lolium perenne* L. showed no evidence of genetic exchange, only barren perithecia being differentiated. This may be, as mentioned elsewhere (Morgan-Jones *et al.*, 1990), a case of hybrid inviability similar to that known to occur in some other closely related fungal species (Burnett, 1983). The isolation of *A. coenophialum* within tall fescue and the apparently constant differences in conidium morphology between it and *A. typhinum* indicate some measure of divergence. The fact that different teleomorph species often have almost indistinguishable anamorphs, both macroconidial and microconidial, as in the two species of *Atkinsonella*, underlies the difficulty in attaining a phylogenetically sound classification based on anamorphs alone. Isolation within their respective allopatric hosts, *Danthonia* spp. [*D. compressa* Austin, *D. sericea* Nutt., and *D. spicata* (L.) Beauv., three often sympatric species] and *Stipa leucotricha* Trin. & Rupr., respectively, supports the recognition of *A. hypoxylon* and *A. texensis* as separate species (Leuchtmann and Clay, 1989). There are clearly varying degrees of genetic distance among species of sect. *Albo-lanosa* and some of the taxa presently included therein are more readily distinguishable than others. Reassessment of the status of at least some, following more extensive study, is anticipated.

EVOLUTION AND SPECIATION

Several aspects of the evolution of the Balansieae have been given consideration in recent years. These include whether the tribe is monophyletic or polyphyletic, what type of host/fungus relationship is ancestral and which is of more recent origin, the coevolution of these fungi with their host grasses and the change from parasitism to mutualism (Clay, 1988; Leuchtmann and Clay, 1988; White and Morgan-Jones, 1992). Leuchtmann and Clay (1988) suggested that ancestral forms of the Balansieae may have resembled *Claviceps* as known today. That is, the tribe may have originated from localized ovarian parasites that were, at first, non-systemic. Advent of an endophytic rather than an epiphytic habit was thought to have depended upon whether or not a fungus could invade gynoecial tissues intercellularly, but not destroy the ovaries, and subsequently become incorporated into the embryo and seed. The endophyte could then become systemic and perennial in its host. If the fungus remained on or in between the integuments and the embryo sac wall, an epiphytic habit would ensue. It is generally agreed that, as mentioned in the introduction, within the Balansieae a progressively systemic, endophytic, grass colonization trend is evident, with associated adaptive physiological changes leading to a mutualistic association (Clay, 1988; White and Morgan-Jones, 1992).

In regard to habit, species of *Atkinsonella* exhibit what is considered to be the more primitive host/pathogen relationship within the tribe. *Atkinsonella hypoxylon* was shown by Clay and Jones (1984) to grow around the embryo of *Danthonia spicata* and Philipson and Christey (1985) reported the same fungus to be associated with the surface of the embryo or with the embryo sac wall. Its hyphae are not known to grow intercellularly within host tissues as is characteristic of the endophytic species of the Balansieae. Inflorescence primodia of grasses colonized by *A. hypoxylon* are often destroyed, however, as stromata are elaborated around them.

If species of the Balansieae are believed to have coevolved with their host grasses along similar lines as members of the Uredinales (Savile, 1987), a sequential chronology of origin reflective of host association can be hypothesized (White and Morgan-Jones, 1992). Species such as *Balansia linearis* (Rehm) Diehl and *Balansiopsis gaduae*, that occur on bambusoid grasses (Diehl, 1950), may be among the oldest of the Balansieae, followed by those on arundinoid hosts. *Balansia epichloe* and *B. strangulans*, species whose hosts are chloridoid and panicoid grasses, followed by *Epichloe typhina* and *Acremonium* section *Albo-lanosa* anamorphs, that occur on pooid grasses, may be more recently evolved.

As indicated above, it is difficult to determine how best to treat some forms of the Balansieae taxonomically, particularly anamorphs that are assumed to be phylogenetically closely related, and to equate their various characteristics with a particular level of species divergence. Whether such entities as *A. coenophialum*, *A. lolii* and *A. starrii* merely represent early stages in incipient speciation is not clear. Information on some of the basic parameters of speciation, including data on individual species as breeding populations, and on genetic isolation, is inadequate. Allopatric speciation, where components of a widespread population become separated by ecological or physical barriers, resulting in eventual genetic divergence and inability to interbreed, is presumed to have occurred in the Balansieae. Levels of divergence that are indicative of this phenomenon are known in the fungi (Burnett, 1983), particularly among pathogenic species, where host relationships and associated physiological adaptive changes contribute to isolation. Where entities are reproductively isolated, they are generally regarded as biological species and given specific taxonomic recognition, particularly when exhibiting concomitant morphological differences. Although speciation may be predominantly allopatric, the possibility of sympatric speciation exists, where isolation occurs within a population of potentially interbreeding individuals. A number of examples of supposed sympatric speciation are known among fungi and microhabitat selection is thought to be a primary predisposing factor. Within the Balansieae, host specificity is common and sometimes narrow as, for instance, in *Balansia aristidae* and *B. cyperi*. The former has, as already indicated, a host range limited to species of *Aristida*, including *A. dichotoma* Michx, *A. purpurascens* Poir, and *A. stricta* Michx (Diehl, 1950). The latter infects *Cyperus rotundus* L. and *C. virens* Michx (Clay, 1986b; Leuchtmann and Clay, 1988). This occurs to varying degrees. Some species are restricted to particular genera or only one or two species within them, as in the case of *Atkinsonella* spp. and *B. cyperi*, whereas others, such as *B. strangulans*, which occurs on panicoids [mainly species of *Panicum* L.], are limited in their occurrence to one group of hosts. Others, such as *B. epichloe*, have a much wider host range. Diehl (1950) reported *B. strangulans* to be found almost invariably on one host in particular localities, although other known host grasses grew in immediate vicinity or intermixed in the observed populations. This suggested the existence of host-specific biotypes of *B. strangulans*, or varying susceptibilities among different populations of the same host species. There may well be, within what is now known as *B. strangulans*, divergence, with forms isolated from one another in different host species. A form of *B. strangulans*, designated forma *discoidea* (P. Henn.) Diehl (Diehl, 1950) [≡ *Balansia discoidea* P. Henn.] is known from chloridoid as well as panicoid grasses. True measure of variation within any population, not to mention species, has not been achieved. *Balansia aristidae*, as already mentioned, differs very little from *B. strangulans*, other than in host association, and has possibly genetically diverged from it only a little further than a number of others forms. The degree of morphological and biological difference appears comparable to that between the two recognized species of *Atkinsonella*. It should be noted that *A. hypoxylon* and *A. texensis* occur on grasses belonging to different subfamilies not thought to be closely related (Gould and Shaw, 1983), namely Arundinoideae and Pooideae, respectively. Likewise, the known hosts of *B. aristidae* and *B. strangulans* belong in different subfamilies, Chloridoideae and Panicoideae, although *B. strangulans* forma *discoidea* crosses these subfamily lines. Interestingly, the three species of *Danthonia* DC. which *A. hypoxylon* infects are often sympatric within their geographical range in eastern North America but their distribution does not overlap that of *Stipa leucotricha* Trin. & Rupr. the host of *A. texensis* [see Leuchtmann and Clay, (1989)]. These fungi and their hosts, in effect, occur allopatrically. Based on isozyme analysis, Leuchtmann and Clay (1989) reported genetic distance between *A. hypoxylon* and *A. texensis*, despite their morphological similarity, to be of a magnitude similar to distantly related species of fungi. Furthermore, this distance was estimated, again based on isozyme variation, to be in the same range as that between such species of *Balansia* as *B. cyperi*, *B. epichloe*, *B. henningsiana* and *B. obtecta*. The varying genetic distance among anamorphs, alluded to above, seems also evident among teleomorphs. Quite clearly, habitat selection and grass host specificity have played an important role in Balansieae divergence and speciation.

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LITERATURE CITED

BACON, C.W., J.K. PORTER, and J.D. ROBBINS. 1975. Toxicity and occurrence of *Balansia* on grasses from toxic fescue pastures. *Appl. Microbiol.* 29: 553-556.

BRADSHAW, A.D. 1959. Population differentiation in *Agrostis tenuis* Sibth. II. The incidence and significance of infection by *Epichloe typhina*. *New Phytol.* 58: 310-315.

BURNETT, J.H. 1983. Presidential address. Speciation in fungi. *Trans. Br. mycol. Soc.* 81: 1-14.

CHRISTENSEN, M.J., G.C.M. LATCH, and B.A. TAPPERS. 1991. Variation within isolates of *Acremonium* endophytes from perennial rye-grasses. *Mycol. Res.* 89: (in press).

CLAY, K. 1984. Effect of the fungus *Atkinsonella hypoxylon* (Clavicipitaceae) on the reproductive system and demography of the grass *Danthonia spicata*. *New Phytol.* 98:165-175.

CLAY, K. 1986a. Grass endophytes. In Microbiology of the Phyllosphere. N.J. Fokkema and J. van den Heuvel eds., Cambridge University Press: 188-204.

CLAY, K. 1986b. New disease (*Balansia cyperi*) of purple nutsedge (*Cyperus rotundus*). *Plant Dis.* 70: 597-599.

CLAY, K. 1988. Clavicipitaceous fungal endophytes of grasses: coevolution and the change from parasitism to mutualism. In Coevolution of Fungi with Plants and Animals. D.L. Hawksworth and K. Pirozynski eds., Academic Press: 79-105.

CLAY, K., and J.P. JONES. 1984. Transmission of the fungus *Atkinsonella hypoxylon* (Clavicipitaceae) by cleistogamous seed of *Danthonia spicata* (Gramineae). *Can. J. Bot.* 62: 2893-2898.

CLAY, K., and A. LEUCHTMANN. 1989. Infection of woodland grasses by fungal endophytes. *Mycologia* 81: 805-811.

CLAY, K., T.N. HARDY, and A.M. HAMMOND, JR. 1985. Fungal endophytes of grasses and their effects on an insect herbivore. *Oecologia* 66: 1-6.

DIEHL, W.W. 1950. Balania and Balansiae in America. Agric. Monograph No. 4, USDA, Washington, D.C. 82 pp.

DOGUET, G. 1960. Morphologie, organogénie et evolution nucléaire de l'*Epichloe typhina* . La place des Clavicipitaceae dans la classification. *Bull. Soc. Mycol. Fr.* 76: 171-203.

FLETCHER, L.R. and I.C. HARVEY. 1981. An association of a *Lolium* endophyte with ryegrass staggers. *N. Z. Vet. J.* 29: 185-186.

GAMS, W. 1971. *Cephalosporium*-artige Schimmelpilze (Hyphomycetes). Gustav Fischer Verlag. 262 pp.

GAMS, W., O. PETRINI, and D. SCHMIDT. 1990. *Acremonium uncinatum*, a new endophyte in *Festuca pratensis*. *Mycotaxon* 37: 67-71.

GAUMANN, E.A. 1926. Vergleichende morphologie der pilze. Jena. 626 pp.

GOULD, F.W., and R.B. SHAW. 1983. Grass Systematics. 2nd Ed. Texas A & M University Press, College Station. 397 pp.

GOVINDU, H.C. and M.J. THIRUMALACHAR. 1961. Studies of some species of *Ephelis* and *Balansia* occurring in India. I. Morphological account of some species of *Ephelis*. *Mycopathol. et Mycol. Appl.* 14: 189-197.

GRÖGER, D. 1972. Ergot. In Microbial Toxins. Vol. 8. S. Kadis, A. Ciegler, and S.J. Ajl eds., Academic Press: 321-373.

HANLIN, R.T., and O. TORTOLERO. 1990. Icones Ascomycetum Venezuelae: *Myriogenospora atramentosa*. *Mycotaxon* 39: 237-244.

HARBERD, D.J. 1961. Note on choke disease of *Festuca rubra*. Scot. Pl. Br. Sta. Rep. 1961: 47-51.

HARDY, T.N., K. CLAY, and A.M. HAMMOND. 1986. The effect of leaf age and related factors on endophyte-mediated resistance to fall armyworm (Lepidoptera: Noctuidae) in tall fescue. *J. env. Ent.* 15: 1083-1089.

HAWKSWORTH, D.L. 1974. Mycologist's Handbook. Commonwealth Mycological Institute. 231 pp.

KIRBY, E.J.M. 1961. Host-parasite relations in the choke disease of grasses. *Trans. Br. mycol. Soc.* 44: 493-503.

KOHLMEYER, J., and E. KOHLMEYER. 1974. Distribution of *Epichloe typhina* (Ascomycetes) and its parasitic fly. *Mycologia* 66: 77-86.

LATCH, G.C.M., M.J. CHRISTENSEN, and G.J. SAMUELS. 1984. Five endophytes of *Lolium* and *Festuca* in New Zealand. *Mycotaxon* 20: 535-550.

LEUCHTMANN, A. and K. CLAY. 1988. *Atkinsonella hypoxylon* and *Balansia cyperi*, epiphytic members of the Balansieae. *Mycologia* 80: 192-199.

LEUCHTMANN, A., and K. CLAY. 1989. Morphological, cultural and mating studies in *Atkinsonella*, including *A. texensis*. *Mycologia* 81: 692-701.

LINDAU, G. 1897. Hypocreales; Dothideales. In A. Engler and K. Prantl, Die Naturlichen Pflanzenfamilien ihren Gattungen. Pt. 1: 513 pp.

LUTTRELL, E.S. 1977. The disease cycle and host-fungus relationships in Dallisgrass ergot. *Phytopathology* 67: 1461-1468.

LUTTRELL, E.S. 1980. Host-parasite relationships and development of the ergot sclerotium in *Claviceps purpurea*. *Can. J. Bot.* 58: 942-958.

LUTTRELL, E.S., and C.W. BACON. 1977. Classification of *Myriogenospora* in the Clavicipitaceae. *Can. J. Bot.* 55: 2090-2097.

LYONS, P.C., R.D. PLATTNER, and C.W. BACON. 1986. Occurrence of peptide and clavine ergot alkaloids in tall fescue. *Science* 232: 487-489.

MHASKAR, D.N.. and V.G. RAO. 1976. Development of the ascocarp in *Epichloe cinerea* (Clavicipiaceae). *Mycologia* 68: 994-1001.

MORGAN-JONES, G., and W. GAMS. 1982. Notes on Hyphomycetes. XLI. An endophyte of *Festuca arundiancea* and the anamorph of *Epichloe typhina*, new taxa in one of two new sections of *Acremonium*. *Mycotaxon* 15: 311-318.

MORGAN-JONES, G., and J.F. WHITE, JR., 1989. Concerning *Atkinsonella texensis*, a pathogen of the grass *Stipa leucotricha*: developmental morphology and mating system. *Mycotaxon* 35: 455-467.

MORGAN-JONES, G., J.F. WHITE, JR., and E.L. PIONTELLI. 1990. Endophyte-host associations in forage grasses. XIII. *Acremonium chilense*, an undescribed endophyte occurring in *Dactylis glomerata* in Chile. *Mycotaxon* 39: 441-454.

NANNFELDT, J.A. 1932. Studien uber de Morphologie und Systematik der nicht-lichenisierten inoperculaten Discomyceten. *Nova Acta Reg. Soc. Sci. Uppsal.*, ser. 4, 8: 1-368.

PHILIPSON, M.N., and M.C. CHRISTEY. 1985. An epiphytic/endophytic fungal associate of *Danthonia spicata* transmitted through the embryo sac. *Bot. Gaz.* 146: 70-81.

RYKARD, D.M., E.S. LUTTRELL. and C.W. BACON. 1982. Development of the conidial state of *Myriogenospora atramentosa. Mycologia* 74: 648-654.

RYKARD, D.M., E.S. LUTTRELL, and C.W. BACON. 1984. Conidiogenesis and conidiomata in the Clavicipitoideae. *Mycologia* 76: 1095-1103.

RYKARD, D.M., C.W. BACON, and E.S. LUTTRELL. 1985. Host relations of *Myriogenospora atramentosa* and *Balansia epichloe* (Clavicipitaceae). *Phytopathology* 75: 950-956.

SAVILE, D.B.O. 1987. Use of rust fungi (Uredinales) in determining ages and relationships in Poaceae. In Grass Systematics and Evolution. T.R. Soderstrom, K.W. Hilu, C.S. Campbell and M.E. Barkworth eds., International Grass Symposium, Washington, D.C.: 168-178.

SACCARDO, P.A. 1881. Fungi veneti novi vel critici v. Mycologiae Venetae addendi. *Michelia* 2: 241-301.

SAMPSON, K. 1933. The systematic infection of grasses by *Epichloe typhina* (Pers.) Tul. *Trans. Br. mycol. Soc.* 18: 30-47.

SCHARDL, C.L., and M.R. SIEGEL. 1991. Molecular genetics of *Acremonium coenophialum* and *Epichloe typhina. Agr. Ecosystems Environ.* 37: (in press).

SIEGEL, M.C., G.C.M. LATCH and M.C. JOHNSON. 1985. *Acremonium* fungal endophytes of tall fescue and perennial ryegrass: significance and control. *Plant Disease* 69: 179-183.

SPEGAZZINI, C. 1885. Fungi guaranitici. Pugillus I. *Ann. Soc. Cient. Argent.* 19: 34-48.

SPEGAZZINI, C. 1922. Fungi Paraguayenses. *An. Mus. Nac. Hist. Nat. Buenos Aires* 31: 355-450.

ULLASA, B.A. 1969. *Balansia claviceps* in artificial culture. *Mycologia* 61: 572-579.

VON HOHNEL, F. 1910. Fragment zur Mykologie. 630. *Sber. Akad. Wiss. Wien* 119: 933-941.

WALKER, J. 1970. Systemic fungal parasite of *Phalaris tuberosa* in Australia. *Search* 1: 81-83.

WESTERN, J.H., and J.J. CAVETT. 1959. The choke disease of cocksfoot (*Dactylis glomerata*) caused by *Epichloe typhina* (Fr.) Tul. *Trans. Br. mycol. Soc.* 42: 298-307.

WHITE, J.F., JR. 1987. The widespread distribution of endophytes in the Poaceae. *Plant Disease* 71: 340-342.

WHITE, J.F., JR., and T.L. BULTMAN. 1987. Endophyte-host associations in forage grasses. VIII. Heterothallism in *Epichloe typhina. Am. J. Bot.* 74: 1716-1721.

WHITE, J.F., JR., and G. MORGAN-JONES. 1987a. Endophyte-host associations in forage grasses. VII. *Acremonium chisosum*, a new species isolated from *Stipa eminens* in Texas. *Mycotaxon* 28: 179-189.

WHITE, J.F., JR., and G. MORGAN-JONES. 1987b. Endophyte-host associations in forage grasses. IX. Concerning *Acremonium typhinum* the anamorph of *Epichloe typhina. Mycotaxon* 29: 489-500.

WHITE, J.F., JR., and G. MORGAN-JONES. 1987c. Endophyte-host associations in forage grasses. X. Cultural studies on some species of *Acremonium* sect. *Albo-lanosa*, including a new species, *A. starrii*. *Mycotaxon* 30: 87-95.

WHITE, J.F., JR., and G. MORGAN-JONES. 1992. Morphological and physiological adaptations of Balansieae and trends in the evolution of grass endophytes. *Phytopathology* 82: (in press).

WHITE, JR., J.F., G.T. COLE and G. MORGAN-JONES. 1987. Endophyte-host associations in forage grasses. VI. A new species of *Acremonium* isolated from *Festuca arizonica*. *Mycologia* 79: 148-152.

WHITE, JR., J.F., A.C. MORROW, G. MORGAN-JONES and D.A. CHAMBLESS. 1991. Endophyte-host associations in forage grasses. XIV. Primary stromata formation and seed transmission in *Epichloe typhina*: developmental and regulatory aspects. *Mycologia* 83: 72-81.

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TAXONOMICAL STUDIES ON USTILAGINALES. IX.*

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ABSTRACT

NEW SPECIES proposed: Entyloma deliliae Vánky, Döbbeler & U. Braun (type on Delilia biflora). – Entorrhiza finerani Vánky (type on Scirpus cernuus and Scirpus basilaris). – Entorrhiza parvula Vánky (type on Eleocharis parvula). – Farysia corniculata Vánky (type on Carex lemanniana).

NEW COMBINATION proposed: Doassansiopsis limnocharidis (Ciferri) Vánky, based on Doassansia limnocharidis (type on Limnocharis flava).

The following names are considered SYNONYMS: Ustilago compacta G. W. Fischer (type on Lolium multiflorum) is Ustilago bullata Berk. (type on Agropyron scabrum). – Ustilago helictotrichi Schmiedekn. (type on Helictotrichon sp.) is Ustilago trebouxii H. & P. Sydow (type on Melica ciliata).

New results obtained in my taxonomical investigations of smut fungi of the world are presented in this current paper, one of a series.

NEW SPECIES PROPOSED

Entyloma deliliae Vánky, Döbbeler & U. Braun, sp. nov.

Typus in matrice Delilia biflora (DC.) Spreng. (Elvira biflora DC.; Compositae), Costa Rica, Prov. San José, Mt. Cerros de Escazú, prope Matinilla, alt. 1450 m, 19.VIII.1990, leg. P. Döbbeler. Holotypus in Herbario Ustil. Vánky (HUV 15266!); isotypi in Herb. Döbbeler (6466), BPI, USJ. Paratypus: prope San José, Desamparadoe, 30.XII.1924, H. Sydow (sub Cercosporella elvirae Sydow, nomen herb.; B!).

Sori (Fig. 1) maculae foliorum inconspicuae, venis circumscriptae, diametro 0,5–2 mm, vel confusione majores, primo pallide virides, serius pallide brunnei, in pagina inferiore foliorum saepe propter anamorpham albidi. Sporae (Fig. 2) in textis matricis immersae, globosae, subglobosae, ovoideae vel propter pressionem mutuam parum irregulares, 8–12 x 9,5–15 µm, pallide- vel aureo-flavae; pariete aequaliter cca. 1 µm crasso, levi. Anamorpha praesens.

Sori (Fig. 1) in the leaves as inconspicuous, vein-limited spots, 0.5–2 mm in diameter, or larger by coalescence, first light green, later light brown, often whitish on the underside of the leaves due to the anamorph. Spores (Fig. 2) embedded in the host tissue, globose, subglobose, ovoid or slightly irregular by mutual pressure, 8–12 x 9.5–15 µm, pale- to golden-yellow; wall uniform, c. 1 µm thick, smooth. Anamorph present.

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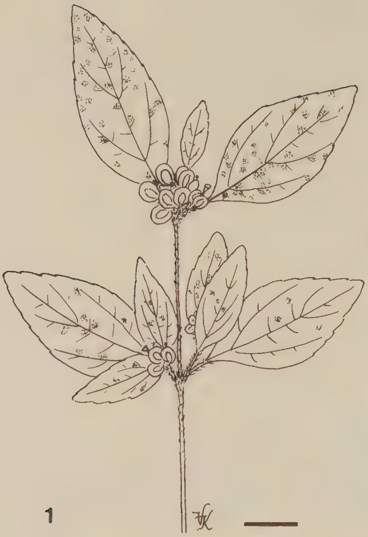
*Studies in Heterobasidiomycetes, part 93



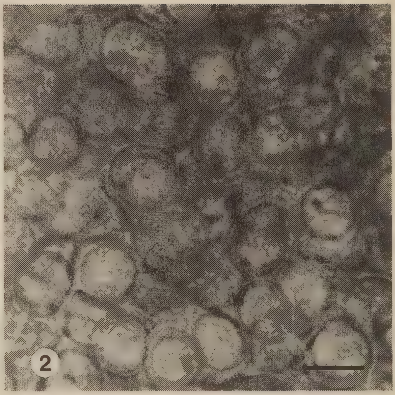


Fig. 1. Sori of Entyloma deliliae Vánky, Döbbeler & U. Braun, on the leaves of Delilia biflora (DC.) Spreng. Type. (Bar = 1 cm).

Fig. 2. Spores of E. deliliae Vánky, Döbbeler & U. Braun. Type. (Bar = 10 μm).

Entorrhiza on Scirpus and Eleocharis.

In her monograph of Entorrhiza, J. M. Fineran (1978b:37) gave spore measurements for E. scirpicola (Correns) Saccardo & P. Sydow (on different Eleocharis and Scirpus species) of (10–)13–20(–23.5) x (16–)18–28.5(–31.5) μm, while Correns (1897:38) for his Schinzia scirpicola (on Scirpus pauciflorus Lightf. = Eleocharis quinqueflora (F. X. Hartmann) O. Schwarz), the type of E. scirpicola, gave 11–14 x 16–20 μm. This discrepancy stimulated me to check the literature and herbarium specimens, i. a. those obtained from Dr. Judith M. Fineran, during my visit to New Zealand. Hooper & Spooner (1981), studying four collections of E. scirpicola on Eleocharis quinqueflora from Great Britain, gave spore measurements of 9–13 x 13–16.5 μm. I found spores of the type specimen to be 11–16 x 13–20 μm (including ornamentation). Fineran, in the characterisation of E. scirpicola, besides examining the type and a collection on Eleocharis quinqueflora from Färöarna, included also collections on Scirpus basilaris, S. cernuus, and S. setaceus from New Zealand. These collections differ widely from the type of E. scirpicola. The spores are considerably larger, lemon-shaped and long-ellipsoidal rather than broadly ellipsoidal and, as Fineran (1978b:40) correctly remarked "in the New Zealand collections, the ridges are usually almost parallel to the longitudinal axis of the spore" (comp. also Fineran, 1971:501, Fig. 7; 1978a:845, Figs 25-28), while in the type the ridges are obliquely disposed in irregular spiral lines, often interrupted, anastomosing and branching, as illustrated beautifully by Hooper & Spooner (1981:504, Fig. 1 c). In the New Zealand specimens the ridges are rather uniform.

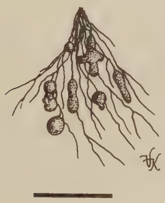
On Scirpus and Eleocharis, besides E. scirpicola, there are several well-delimited Entorrhiza species, such as E. raunkiaeriana Ferdinandsen & Winge (1914:8), on Scirpus fluitans L., an undescribed species on Scirpus parvulus (in Rbh., Fgi. eur. 1199b), and another species on some specimens from New Zealand. For the latter I am proposing the name:

Entorrhiza finerani Vánky, sp. nov.

Typus in matrice Scirpus cernuus Vahl, New Zealand, Snares Is., Sink Hole Flat, III.1971, leg. D. S. & C. J. Horning. Holotypus in Herbario Ustil. Vánky (HUV 14797!); isotypus in CANU 16026. Topotypus 1.II.1961, leg. B. A. Fineran (HUV 14796!, CANU 16002). Paratypus in matrice Scirpus basilaris (Hooker fil.) C. B. Clarke, New Zealand, North Island, Turakina Beach, south of Wanganui, XI.1967, leg. A. P. Druce (HUV 14795!, CANU 16003).

Sori (Fig. 3) gallas radicum pallide brunneas usque atrofuscas, globosas, ovoideas vel ramificatas, sicce 1–2,5 x 1–5 mm, massa sporarum pallide brunnea, agglutinata, intracellulariter disposita repletas formantes. Sporae (Figs 4, 5) vel limoniiformes usque elongate ellipsoidales cum papillis singulis in extremis ambis et ad extremum unum pedicello brevi (nonnunquam absenti; residuo mycelii sporiferi), vel rarius late ellipsoidales sine papillis sive modo papillis parvulis instructae, 12–16 x 15–25(–30) µm (una cum ornamento), subhyalinae usque citrino-flavae; pariete crasso (2–5) µm), 2-striato, strato interiori tenui (cca. 0,8 µm), aequali, strato externo inaequali, ad ambos extremos sporarum praecipue incrassato. Superficies sporarum cristis asperis, cum axe longitudinali sporarum parallelis, plerumque simplicibus, sed nonnunquam bifurcatis vel, propter incrementa nonnulla tuberculiformia, irregularibus ornata. Cristae saepe etiam papillas contingentes. Cristae a latere 6–8, ab apice in linea extrema aequatoriali sporarum 14–20(–24) visibiles.

Sori (Fig. 3) on the roots as light to dark brown, globose, ovoid or branched galls, when dried 1–2.5 x 1–5 mm, filled by pale brown, agglutinated, intracellular spore masses. Spores (Figs 4, 5) lemon-shaped to elongate-ellipsoidal with a papilla on each end, and a short (sometimes absent) pedicel on one end (the rest of the sporogenous mycelium), more rarely broadly ellipsoidal, without or with only small papillae. Spores 12–16 x 15–25(–30) µm (including ornaments), subhyaline to lemon-yellow; wall thick (2–5 µm), two-layered, inner layer thin (c. 0.8 µm), uniform, outer layer uneven, thickest at the two ends of spores. Spore surface provided with coarse ridges situated parallel to the long axis of the spore, only exceptionally oriented slightly obliquely, sometimes bifurcate or, due to a few tuberculate thickenings, irregular. Ridges often comprise even the papillae. In lateral view 6–8 ridges are visible; looking from the longitudinal axis of the spore, 14–20(–24) ridges appear on the equatorial circumference of a spore.



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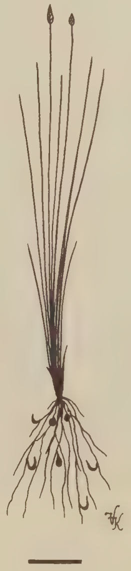

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Fig. 3. Sori of Entorrhiza finerani Vánky, on the roots of Scirpus cernuus Vahl. Type.
Fig. 6. Sori of Entorrhiza parvula Vánky, on the roots of Eleocharis parvula. Type. The globose or ovoid sori must not be confused with the falciform buds.
(Bars = 1 cm).

In Rabenhorst, Fungi europaei 1199b, together with, and under the name Ustilago marina DR., on Scirpus parvulus, growing in brackish sea-shore water, was also distributed an Entorrhiza which differs from known species:

Entorrhiza parvula Vánky, sp. nov.

Typus in matrice Eleocharis parvula (Roemer & Schultes) Link ex Bluff, Nees & Schauer (Scirpus parvulus Roemer & Schultes), France, Dépt. Gironde, Bassin d'Arcachon, prope Arès, VIII.1866, leg. M. C. Durieu de Maisonnevue. Holotypus in Herbario Ustil. Vánky (HUV 15270!); isotypi in Rbh., Fgi. eur. 1199b (una cum et sub nomine Ustilago marina. "Tubercules radicaux").

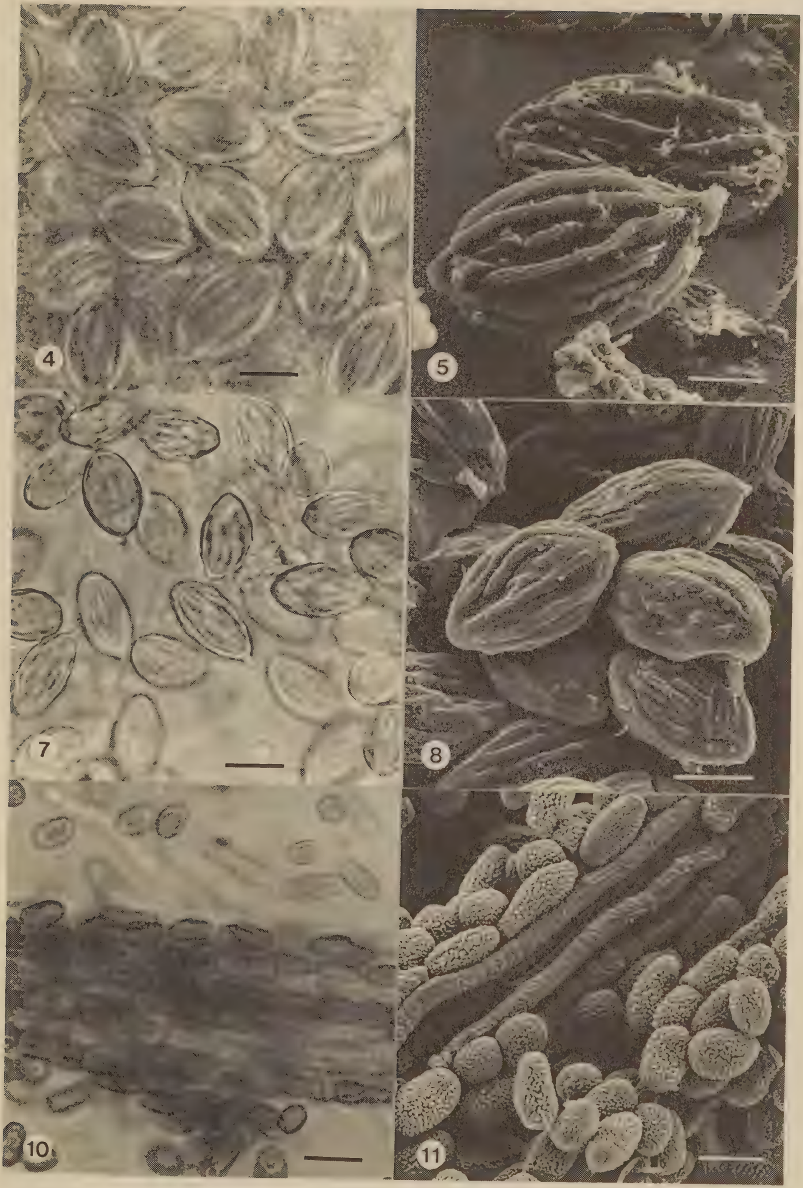
Sori (Fig. 6) gallas radicum pallide brunneas usque atrofuscas, globosas, ovoideas, 1–2 mm diam. (an etiam majores?), massa sporarum agglutinata, pallide rubiginosa repletas formantes. Sporae (Figs 7, 8) late ellipsoidales usque plerumque elongato-ellipsoidales, 9–12 x 12–20 µm, pallide flavae usque citrino-flavae, plerumque papillis nullis, saepe ad extremum unum breviter pedicellatae; pariete tenui (0,8–1 µm), cristis tenuibus, irregularibus, saepe interruptis, bifurcatis vel anastomosantibus, parum undulatis, cum axe longitudinali sporarum parallelis ornato. Cristae a latere 5–6, ab apice in linea extrema aequatoriali sporarum 12–16 visibiles.

Sori (Fig. 6) on the roots as globose or ovoid, dark brown galls of 1–2 mm diameter (or larger?), filled by agglutinated, light rust-brown coloured spore masses. Spores (Figs 7, 8) broadly ellipsoidal to usually long-ellipsoidal, 9–12 x 12–20 µm, pale yellow to lemon-yellow, papillae usually lacking, but often with a short pedicel on one end; wall thin (0.8–1 µm), provided with faint, irregular, often interrupted, bifurcate or anastomosing, slightly undulate ridges situated parallel to the long axis of the spore. In lateral view 5–6 ridges are visible; looking from the longitudinal axis of the spore, 12–16 ridges appear on the equatorial circumference of a spore.

The sori of Entorrhiza parvula must not be confused with the falciform buds, also present on the roots of the host plants, not either with the 1–2.5 mm long, bullate or onion-like swellings at the base of culms of Eleocharis parvula, which represent the sori of Ustilago marina Durieu de Maisonnevue, with black, agglutinated spore masses. The spores of this latter species are subglobose, ellipsoidal to slightly irregular, subpolyhedral, light brown, 8–13 x 9–14(–15) µm, with smooth, 0.5–0.8 µm thick wall, often with a few, short, hyaline appendages or thickenings.

Key to the species of Entorrhiza on Scirpus and Eleocharis.

1. Spores long-ellipsoidal or lemon-shaped 2
– Spores subglobose or broadly ellipsoidal, 13–20 µm long;
  wall 1–3 µm thick, with coarse, interrupted, branching
  ridges in slight, irregular spiral lines . . . . E. scirpicola
2. Ridges parallel to the long axis of the spores 3
– Ridges in spiral lines. Spores 18–30 µm long;
  wall c. 1 µm thick . . . . E. raunkiaeriana
3. Spores 15–30 µm long, usually with well-developed papillae;
  wall 2–5 µm thick, with coarse ridges . . . . E. finerani
– Spores 12–20 µm long, without papillae;
  wall 0.8–1 µm thick, with faint ridges . . . . E. parvula



Figs 4, 5. Spores of Entorrhiza finerani Vánky, in LM and SEM. Type.
Figs 7, 8. Spores of Entorrhiza parvula Vánky, in LM and SEM. Type.
Figs 10, 11. Spores & elaters of Farysia corniculata Vánky, in LM and SEM. Type.
(Bars of LM pictures = 10 μm, those of SEM pictures = 5 μm).

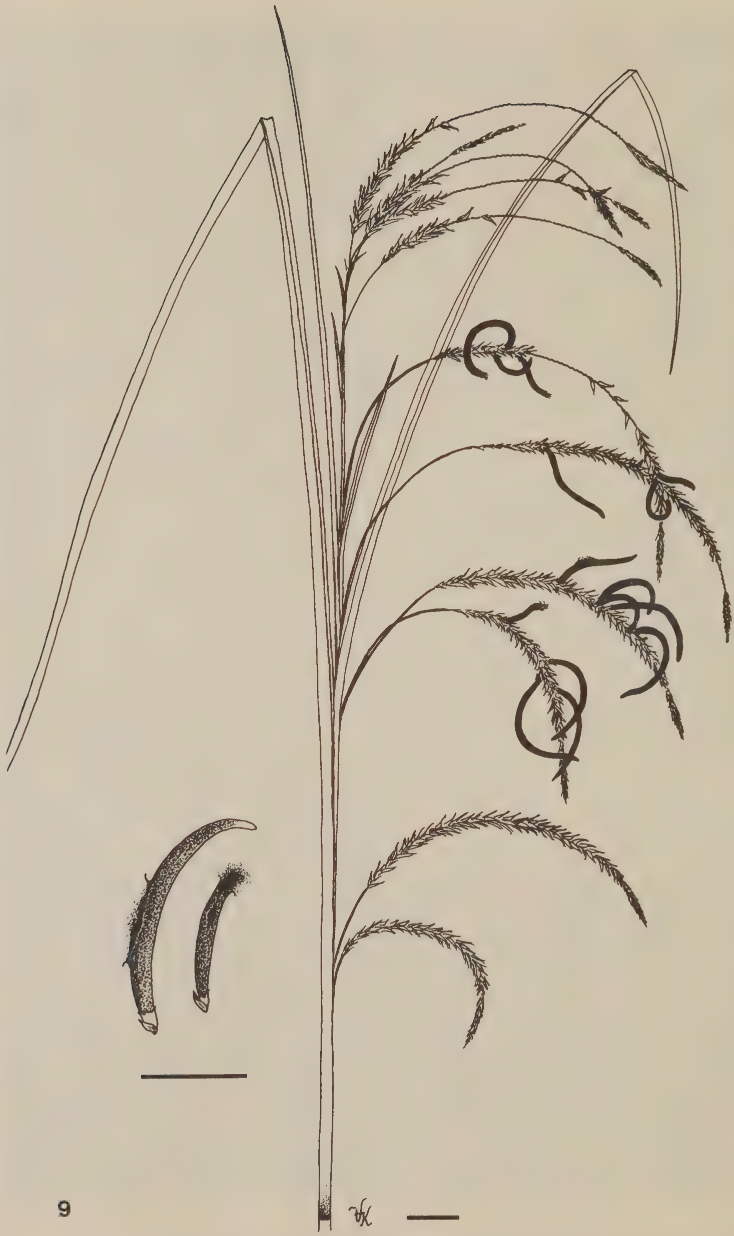


Fig. 9. Sori of Farysia corniculata Vánky, in scattered flowers of Carex lemanniana Boott. Type. (Bars = 1 cm).

A *Farysia* species, with peculiar sori, collected in Costa Rica, could not be identified with any earlier known species (comp. H. & P. Sydow, 1919; Cunningham, 1945; Zundel, 1953), and is described here as:

Farysia corniculata Vánky, sp. nov.

Typus in matrice *Carex lemanniana* Boott (det. J. Gómez-Laurito), Costa Rica, Prov. Cartago, Mts. Cordillera de Talamanca, Mt. Cerro de la Muerte, alt. 2960 m, 29.III.1991, leg. R. Berndt, T. & K. Vánky. Holotypus in Herbario Ustil. Vánky (HUV 15190!); isotypi in BP, BPI, USJ.

Sori (Fig. 9) in floribus dispersis evoluti, corniformes, longe cylindracei, curvati raro spiraliter torti, a nonnullis mm usque ad 30 mm longi, 1–1.5 mm crassi, membrana ("peridium") atrobrunnea satis permanenter cooperti, massam sporarum atroolivaceo-brunneam, pulveream, fasciculos capillitiiformes ("elaterae") in eam admixtos continentes. Et peridium et elaterae e catenis dense conglutinatis cellularum fungi elongatarum steriliumque, naturam propriam jam plus-minus amissarum constructae. Sporae (Figs 10, 11) ovoideae, ellipsoideae, pyriformes, nonnunquam lagunculiformes, irregulares vel globosae, 4–5,5 x (4–)5–12 µm, pallide olivaceobrunneae, tenuiter (c. 0,5 µm) tunicatae, subtiliter dense verrucosae (verrucositate in linea extrema sporarum vix conspicua), verrucae inaequaliter dispersae vel nonnunquam partim in series longitudine varias parallele cum axe longitudinali sporae ordinatae. Germinatio sporarum (Fig. 12) cum basidiis septatis (1–1,5 x 10–25 µm) basidiosporas ellipsoideas, hyalinas, magnitudine 1,5 x 4–6,5 µm in sterigmatibus brevibus lateralibus et apicalibus ferentibus. Cellulae basidii compatibiles, basidiosporae vel cellulae basidii cum basidiosporis coalescere aptae.

Sori (Fig. 9) in scattered flowers, horn-shaped, long-cylindrical, curved, rarely spirally coiled, from a few mm to 30 mm long, 1–1.5 mm wide, covered by a dark brown, leathery, rather permanent membrane ("peridium"). Sori fall off the plant along with the floral envelopes attached to their bases. The dark olivaceous-brown, powdery mass of spores intermixed with long, capillitium-like fascicles ("elaters") is revealed when sori burst longitudinally or beginning at their apices. Peridium and elaters formed of tightly attached chains of elongated, sterile, fungal cells; these cells having more or less lost their individuality. Spores (Figs 10, 11) ovoid, ellipsoidal, pyriform, sometimes bottle-shaped, irregular or globose, 4–5.5 x (4–)5–12 µm, pale olivaceous-brown; wall thin, c. 0.5 µm, densely and finely verruculose. The warts, which just affect the spore profile, are uniformly dispersed or sometimes arranged, in part, in longer or shorter rows parallel to the longitudinal axis of the spores. Germination (Fig. 12) on water-agar, after 1–3 days, at room temperature results in (1–)2–5-celled basidia of 1–1.5 x 10–35 µm. On the basidia, laterally and apically, on short sterigmata, hyaline, ellipsoidal basidiospores are produced measuring 1.5 x 4–6.5 µm. When basidia are less than four cells, additional cells (basidia?, basidiospores?) are born from the spore either adjacent to or opposite the basidium. These cells measure 1.5 x 5–9 µm. After 3 days compatible basidial cells, basidiospores, or basidial cells and basidiospores fuse.

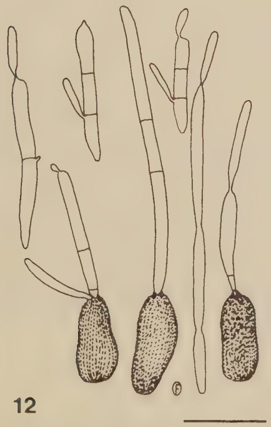


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Fig. 12. Spore germination of *Farysia corniculata* Vánky. Type. (Drawing by F. Oberwinkler; Bar = 10 µm).

NEW COMBINATION PROPOSED

Ciferri (1931:23) described "Doassansia (Doassansiopsis) limnocharidis" on the leaves of Limnocharis flava (L.) Buchen. (Alismataceae), from the Dominican Republic. The name was later accepted (Zundel, 1953:228) as Doassansia limnocharidis Cif. According to Ciferri, the spore balls are formed of a central mass of parenchymatous cells surrounded by a cortical layer of fertile spores. The study of material recently collected in Costa Rica on Limnocharis flava showed that the spore balls are of Doassansiopsis-type, not of Doassansia-type. The spore balls in this species are formed of a central mass of sterile cells surrounded by a layer of spores and a cortex of small sterile cells. In Doassansia species the spore balls are formed of a central mass of spores surrounded by sterile cells (comp. Vánky, 1987:5). Consequently, the name must be recombined as: Doassansiopsis limnocharidis (Ciferri) Vánky, comb. nov.
Basionym: Doassansia limnocharidis Ciferri, Ark. Bot. 23 A (14):23, 1931.

SYNONYMS

Ustilago compacta = U. bullata.

G. W. Fischer (1952:8) described Ustilago compacta from a seed sample of Lolium multiflorum Lam., originating from USA, Oregon, Tangent, 1932. Fischer compared his new species with Ustilago lolii P. Magnus and concluded that they are two different species. The description of the sori and spores of U. compacta is very close to that of U. bullata Berk., except for the spore surface which, according to Fischer, is supposed to be smooth. However, the spores of U. compacta, illustrated by Fischer (1953:251, Fig. 97 F), are clearly verruculose. The study of the type specimens (holotype in BPI 159673!; isotypes in Fischer, Gramin. smuts N. Amer. 265; HUV 10081!) confirmed that U. compacta is identical with U. bullata Berkeley. For U. bullata are typical not only the sori (which are bullate, first agglutinated, later dusty, restricted to the basal part of the glumes and comprising even the ovaries) but also the spores, which are 8–11 µm long, from minutely granular-echinulate to irregularly verruculose, often with a darker equatorial band, and more pronounced verrucae on the polar regions.

Ustilago helictotrichi = U. trebouxii.

The study of the type of Ustilago helictotrichi Schmiedeknecht, in Schmiedeknecht & Puncag (1966:178), on Helictotrichon sp., Mongolia, Uvs-Aimak, Turgen-ul Mts., Burgastyn-gol valley, 15 km S. Urug-nur, alt. 1850–1900 m, 31.VII.1964, M. Schmiedeknecht (2219, JE!) revealed that it is identical with Ustilago trebouxii H. & P. Sydow (type on Melica ciliata, USSR, Novotscherkassk, 23.IV.1911, O. Treboux).

Ustilago trebouxii is characterised by sori in the upper leaves and leaf-sheaths as long, dark brown, early naked, dusty striae, and also in distorted inflorescences, more or less destroying them. Spores globose, subglobose, ovoid to slightly irregular, (3.5–)4–5.5 x 4–7 µm, light olive-brown tending to be lighter on one side, apparently smooth to finely and sparsely punctate-verruculose. Germination results in long, 4-celled basidia, producing naviculiform basidiospores on well-developed sterigmata. It is known from E. Europe, Asia and North America on Agropyron, Clinelymus, Distichlis, Elymus, Helictotrichon, Hordeum, Leymus, Melica, Poa, Puccinellia, Sitanion and Stipa species.

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LITERATURE CITED

Ciferri, R. 1931. Smuts collected in the Dominican Republic by E. L. Ekman. I. - Ark. Bot. 23 A (14):1-29.

Correns, C. 1897. Schinzia scirpicola spec. nov. - Hedwigia: 36:38-40.

Cunningham, G. H. 1945. A revision of the New Zealand species of Farysia. - Trans. & Proc. Roy. Soc. New Zealand 75:328-333.

Ferdinandsen, C. & Winge, Ö. 1914. Studies in the genus Entorrhiza C. Weber. - Dansk Bot. Ark. 2:1-14.

Fineran, J. M. 1971. Entorrhiza C. Weber (Ustilaginales) in root nodules of Juncus and Scirpus in New Zealand. - New Zealand J. Bot. 9:494-503.

— 1978a. A scanning electron microscope study of teliospores in Entorrhiza C. Weber (Ustilaginales). - Nova Hedwigia 29:825-845.

— 1978b. A taxonomic revision of the genus Entorrhiza C. Weber (Ustilaginales). - Nova Hedwigia 30:1-68.

Fischer, G. W. 1952. Some new species of Ustilaginales from North America. - Res. Stud. State Coll. Wash. 20:3-10.

— 1953. Manual of the North American Smut Fungi. - New York, Ronald Press Co., 343 pp.

Hooper, S. S. & Spooner, B. M. 1981. Occurence of Entorrhiza scirpicola (Ustilaginales) on Eleocharis quinqueflora in Britain. - Trans. Brit. Mycol. Soc. 76:499-502.

Schmiedeknecht, M. & Puncag, T. 1966. Ustilaginales aus der Mongolischen Volksrepublik. - Feddes Repert. 73:170-183.

Sydow, H. & P. 1919. Mykologische Mitteilungen. - Ann. Mycol. 17:33-47.

Stafleu, F. A. (ed.) 1981. Index herbariorum. Part I. The herbaria of the world. - Regnum Veget. 106:1-452.

Vánky, K. 1987. Illustrated genera of smut fungi. - Cryptogamic Studies 1:1-159 (ed. W. Jülich). Gustav Fischer Verlag. Stuttgart/New York.

Zundel, G. L. 1953. The Ustilaginales of the World. - Pennsylvania State Coll. School Agric. Dept. Bot. Contrib. 176:XI+1-410.

ABBREVIATIONS

The abbreviations for herbaria follow Index Herbariorum (Stafleu, 1981).
HUV = Herb. Ustilaginales Vánky, the author's private herbarium.

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CONIDIOSPOROMYCES, A NEW GENUS OF USTILAGINALES*

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ABSTRACT

A study of Tilletia ayresii resulted in the description of a new, monotypic genus, Conidiosporomyces Vánky. Morphological characters of the sori, spores, sterile cells and conidia, germination of the spores and conidia, as well as ultrastructure of septal pore and host-parasite interaction are described. Relationship with, and differences from Tilletia and Neovossia are discussed.

INTRODUCTION

Studies of Tilletia species on unusual host families (others than Gramineae), or of Tilletia with unusual characters may result in surprises. Bauch (1938:73) determined that T. sphagni Nawaschin (on Sphagnum spp, Sphagnaceae) was actually a discomycete. During the last decades, it turned out that several species, enumerated in the excellent monograph of the genus Tilletia by Duran & Fischer (1961), do not belong to this genus. T. commelinae Komarov (on Commelina spp., Commelinaceae), and Tilletia rhei Zundel (on Rheum spp., Polygonaceae) germinate with septate basidia of Ustilago type.

Tilletia ayresii Berkeley, on various grasses from the tropics, shows several characters uncommon for Tilletia, e. g., presence of balls of conidia between the ornamented sterile cells and spores, a unique morphology and germination of the conidia, and a peculiar form and structure of the sori. Earlier observations completed by ultrastructural studies and germination of the spores and conidia of recently collected material, showed that a separate genus is needed to accomodate this smut for which the name Conidiosporomyces is proposed.

MATERIAL AND METHODS

Specimens examined: On Setaria sphacelata (Schumach.) Moss var. aurea (A. Br.) W. D. Clayton (S. trinervia Stapf), Kenya, Shimba Hills Reservate near Mombassa, 11.I.1977, K. Vánky (HUV 5586). On Panicum maximum Jacq., Sri Lanka, near Bandarawela, 18.III.1975, K. Vánky (HUV 2143), in Vánky, Ustilaginales exs. No. 186; Nuwara Eliya, 10.XII.1977, K. Vánky (HUV 6859); Kandy, Peradeniya Botanical Garden, 24.I.1980, K. Vánky (HUV 8141); Cameroun, near Yaoundé, IV.1987, N. Ghena (HUV 13120); Costa Rica, Limón Prov., near

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*Studies in Heterobasidiomycetes, part 92

Bribri, 21.II.1989, Oberwinkler & al. (HUV 13975), in Vánky, Ustilaginales exs. No. 691; Cartago Prov., near Pavones, 6.III.1991, T. & K. Vánky (HUV 15196); near Turrialba, 28.III.1991, T. & K. Vánky (HUV 15197); Brasilia, 100 km N.W. São Paulo, Jaguariuna, 6.VI.1989, R. Ghini & W. Bettiol (HUV 15064), in Vánky, Ustilaginales exs. No. 762.

For studies of the soral and ultrastructural characters, fresh material was fixed with 2% glutaraldehyde in 0.1 M Na-cacodylate buffer at pH 7.2 for several days. Following six transfers in 0.1 M Na-cacodylate buffer, the material was postfixed with 1% osmiumtetroxide, washed with distilled water and stained in 1% uranyl acetate for 1 h in the dark. After 5 distilled water washes, the material was dehydrated in an acetone series, embedded in Spurr's resin, sectioned with diamond knive to semi- and ultrathin sections. Semithin sections were stained with new fuchsin and crystal violet, mounted in "Entellan" and studied in a light microscope (LM). Ultrathin sections were mounted on copper-slot-grids, poststained with lead citrate for 5 minutes, and examined in a transmission electronmicroscope (TEM) at 80 kV.

For scanning electron microscopical (SEM) studies, dried spores and conidia were rehydrated in water for one day, followed by four transfers in alcohol series up to 70%, mounted on specimen stub, critical-point dried, and sputter coated with gold-palladium, c. 20 nm.

Conidia germinated on water-agar (WA) at room temperature after 2–3 days. For germination of spores, first the conidia were killed by treating the spore masses with a 0.01% solution of Amisept (di-isobutyl phenoxyethoxyethyl dimethyl-ammonium chloride; used by Kukkonen & Hyytiäinen, 1969, for disinfection of Anthracoidea spores) for 3 hours, washed with distilled water twice for 10 minutes followed by centrifugation. The spores germinated on WA at room temperature after 3 weeks. Developmental cycle, following germination of conidia and basidiospores, were performed on malt-yeast-peptone-agar (MYP). Nuclear conditions were evidentiated by Giemsa staining.

All figures in this paper represent Conidiosporomyces ayresii (Berk.) Vánky, on Panicum maximum Jacq., Costa Rica, Cartago Prov., 10 km E. Turrialba, near Pavones, 9°55' N, 83°37'30"W, alt. 900 m, 6.III.1991, coll. T. & K. Vánky (HUV 15196).

Conidiosporomyces Vánky, gen. nov.

Sori in dispersis ovariis Graminearum, tumefacti, e membrana sacculum apice apertum, partim e textis matricalibus partim e fungo formata et e mixtura sporarum, cellularum sterilium atque pilorum conidiorum in massam centralem semipulveream unita compositi. Columella absens. Sporae pro ratione crasse tunicatae, coloratae, magnitudine mediocrae, cum basidiis non septatis, apice basidiosporas longas producentibus germinantes. Cellulae steriles pallidae, ornamentiis instructae, saepe collapsae. Conidia tenuiter tunicata, leviter dictu Y-formia, hyalina, in pilos plus-minus laxos unita, cum hyphis et conidia blastica et ballistosporas ferentibus germinantia. Porus septorum typi Tilletiae (doliporus sine pileo pori). Typus generis: Conidiosporomyces ayresii (Berkeley) Vánky.

Sori in scattered ovaries of Gramineae, swollen, composed of an apically open, sac-like membrane of host tissue and fungal origin, and a central mass of a semi-powdery mixture of spores, sterile cells and balls of conidia. Columella absent. Spores relatively thick-walled, coloured, medium-large, germinate by aseptate basidia bearing an apical cluster of elongate basidiospores. Sterile cells pale, nearly colourless, ornamented, often collapsed. Conidia thin-walled, mostly

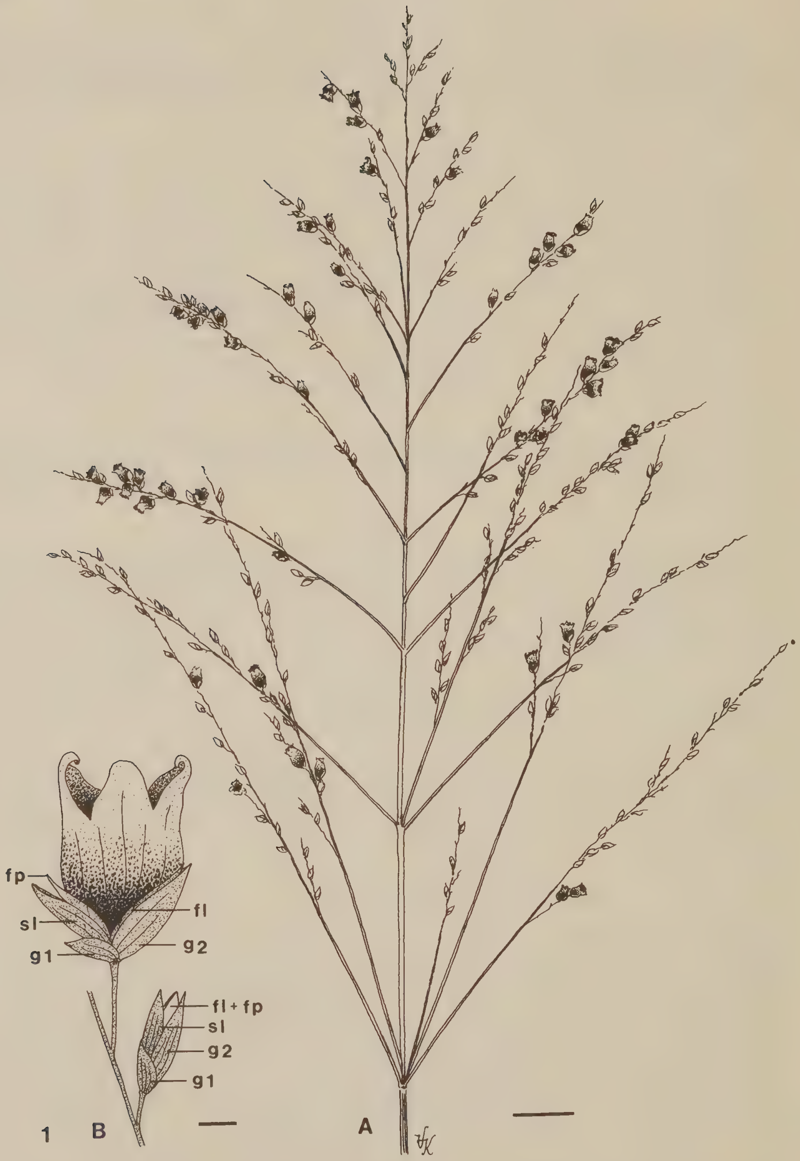

Fig. 1. A. Sori of Conidiosporomyces ayresii (Berk.) Vánky, in scattered ovaries of Panicum maximum Jacq. (Bar = 2 cm). B. A sorus and a healthy spikelet. g1 = first glume; g2 = second glume; sl = sterile lemma, with a thin, hidden palea; fl = fertile lemma, and fp = fertile palea, both indurated in the healthy flower, not indurated in the infected one. (Bar = 1 mm).

Y-shaped, hyaline, arranged in more or less loose balls. Germination of conidia results in hyphae on which both blastic conidia and ballistospores are formed. Septal pore of Tilletia type (dolipore without pore caps). Typus generis: Conidiosporomyces ayresii (Berkeley) Vánky.

Conidiosporomyces ayresii (Berkeley) Vánky, comb. nov.
Basionym: Tilletia ayresii Berkeley, in Massee, Bull. Misc. Inform. 1899:146. – Type on Panicum maximum Jacq., Mauritius, hills above Port Louis, coll. P. B. Ayres (4754), in Herb. Berkeley (K).

Ustilago heterospora P. Hennings, 1895:48 (non Niessl, 1872). – Tilletia heterospora (P. Henn.) Zundel, 1938:310. – Type on Panicum maximum Jacq., Tanganyika Territory, C. H. E. W. Holst (2765).

Tilletia echinosperma Ainsworth, 1941:95. – Type on Setaria sphacelata (Schum.) Moss, Uganda, West Nile, Kajomoro, A. S. Thomas (U. 1995).

Tilletia hyparrheniae Ling, 1953:151. – Type on Hyparrhenia subplumosa Stapf, Sierra Leone, Musaia, 15.XII.1946, F. C. Deighton (M 2553; CMI 11370).

Sori (Figs 1 A, 1 B, 2) in scattered ovaries, inflated, ovoid or cylindrical, 1.5–3 x 2.5–5(–10) mm, composed of an apically open, sac-like, leathery membrane, and a gray to pale olivaceous-brown, semi-powdery central mass of spores, sterile cells and balls of conidia. Columella absent. Sorus membrane thick, dark olivaceous- or reddish-brown at the base, thin, light grayish-brown at its opened, distal part, composed of an external layer of host tissue and an internal layer of sporogenous fungal tissue restricted to the proximal half of the sorus. The sorus membrane (Figs 2, 3) is thickest (10–20 µm) at the base of the sorus, gradually thinning distally. The sporogenous tissue is composed of closely packed, septate, branched hyphae of c. 1.5 µm diameter. Clamp-connexions not seen. Intercellular fungal hyphae (Fig. 4) present in the proximal half of the sorus membrane. Haustoria absent. Spores (Figs 5, 6) relatively thick-walled (2.5–3 µm, including ornamentation), globose, subglobose to ovoid, yellowish-brown to dark brown, 12–16 x 13–17 µm, evidently, often coarsely, sparsely to densely verrucose. Warts in SEM rounded, often with a short, narrow, pointed tip. Two or several warts may fuse. The size of warts varies considerably not only from spore to spore but also on the same spore. Transversal section of the spore wall in TEM (Fig. 7) shows relatively homogenous warts or spines with a few lighter and darker transversal layers. The space between the spines has a loose, wavy, fibrillar structure. Germination of spores (Fig. 9) results in aseptate, aerial basidia, c. 5 µm wide and up to 40 µm long, eventually with a few retraction-septae, but basidia may remain included in the spore. The distal part of the basidium is ramified into 2–8 short branches. On short, apical tubercles of the branches 10–24 basidiospores are produced. Basidiospores (Fig. 9) long cylindrical, slightly curved, 2 x 30–36 µm, hyaline, germinate on both ends

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Fig. 2. Longitudinal section of a sorus of Conidiosporomyces ayresii. A) External layer of host tissue. B) Internal layer of sporogenous fungal tissue, restricted to the proximal half of the sorus. (Bar = 0.5 mm).

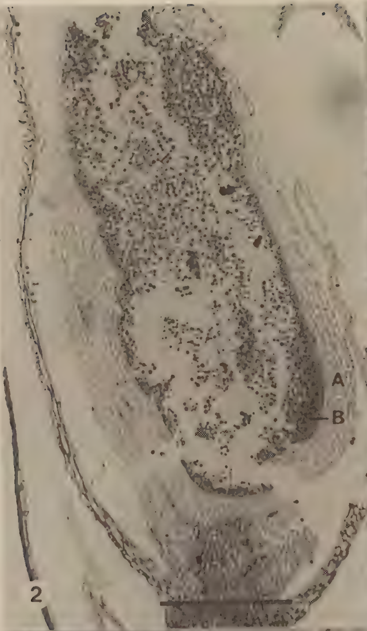
Fig. 3. Sorus membrane from the basal part of the sorus, in LM. A) External layer of large host cells. B) Sporogenous fungal tissue composed of closely packed, septate, branched hyphae with young spores and sterile cells on its surface toward the centre of the sorus. (Bar = 10 µm).

Fig. 4. Intercellular, ramifying hypha of C. ayresii in the sorus membrane from the basal part of the sorus, in TEM (Bar = 1 µm).

Figs 5, 6. Spores, sterile cells and balls of conidia of C. ayresii, in LM and in SEM. (Bars = 10 µm).

Fig. 7. Part of the spore wall of C. ayresii in TEM. (Bar = 1 µm).

Fig. 8. Septal pore of C. ayresii: dolipore without pore caps. (Bar = 0.1 µm).



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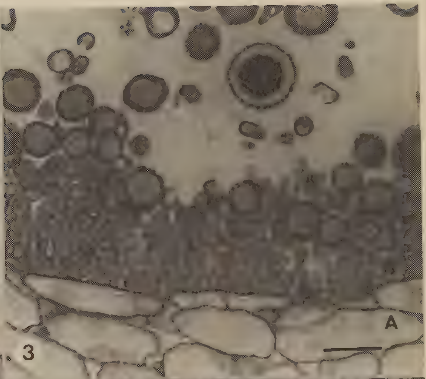

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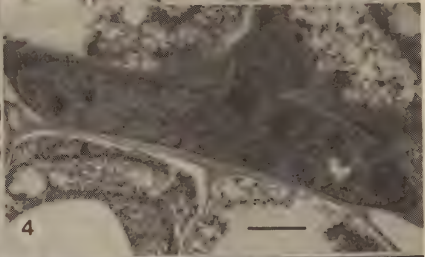

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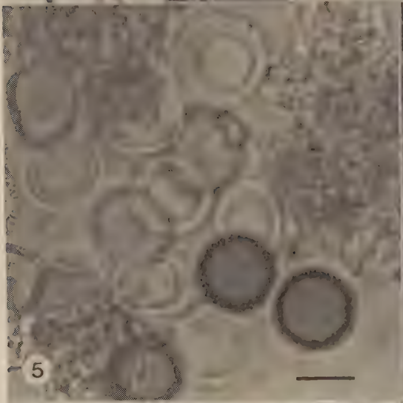

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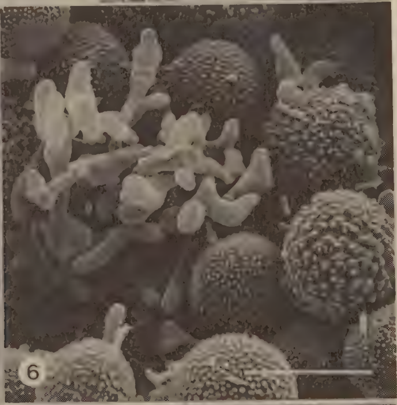

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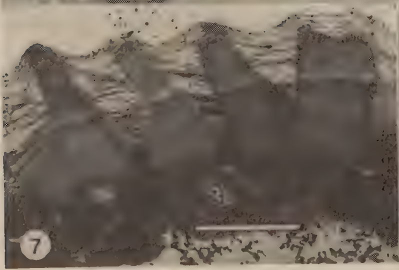

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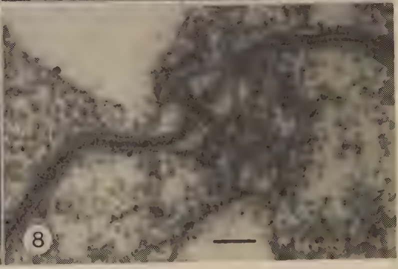

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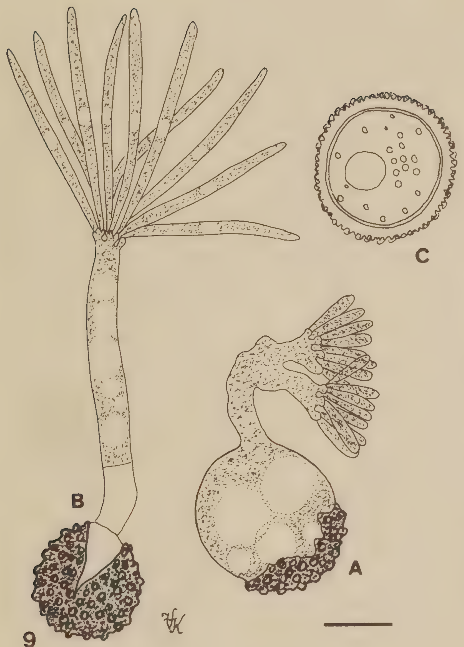

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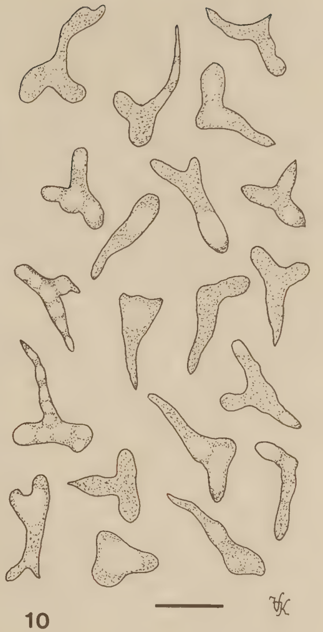

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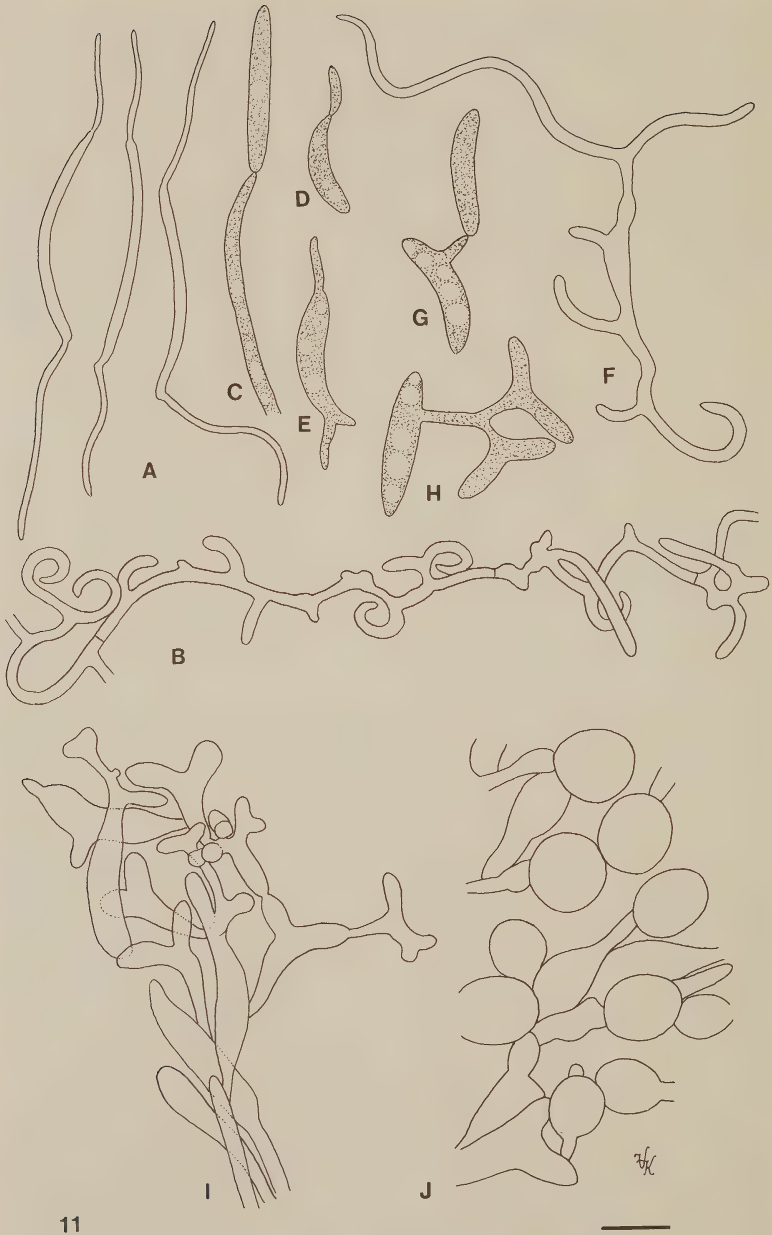
Fig. 9. Spore germination of C. ayresii. A) Early stage. B) Fully developed basidium with two retraction-septae and 10 basidiospores. C) Sterile cell. (Bar = 10 µm).

Fig. 10. Y-shaped conidia of C. ayresii from a sorus. (Bar = 10 µm).

without conjugation (Fig. 11 A), giving rise to ramified, septate hyphae (Fig. 11 B) on which both blastic conidia (Fig. 11 C) and ballistospores are produced. Ballistospores may germinate by blastic conidia (Fig. 11 D), by hyphae (Fig. 11 E, F), by ballistospores (Fig. 11 G) or by Y-shaped conidia (Fig. 11 H). Sterile cells (Figs. 5, 6, 9 C) relatively thin-walled (1.5–2 µm), often with a large vacuole. Sterile cells globose, subglobose or ellipsoidal, subhyaline to pale yellow, 13.5–20 x 14.5–21.5 µm, finely, moderately to densely verruculose, in dried specimens collapsed. The limit between the spores and sterile cells is not always sharp; the relatively small, globose, thin-walled, apparently smooth, hyaline cells between the spores may be either immature spores or young sterile cells. Balls of conidia

Fig. 11. Culture of germinated basidiospores of C. ayresii. A) Germinating basidiospores. B) Hypha. C) Formation of a rod-shaped blastic conidium on the top of a hyphal branch. D) Germinating ballistospore by blastic conidium. E, F) Germinating ballistospores by hyphae. G) Germinating ballistospore by secondary ballistospore. H) Germinating ballistospore(?) by Y-shaped conidia. I) Young ball of Y-shaped conidia formed by repetition. J) Young spores and/or? sterile cells in formation. (Bar = 10 µm).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(Figs 5, 6) globoid, 25–55 µm in diameter, composed of a great number of more or less loosely connected conidia. The spores, sterile cells and balls of conidia are produced from the sporogenous hyphae (Fig. 3) toward the centre of the sorus. Presumably, conidial balls are produced by repetition, as in culture. *Conidia* (Fig. 10) thin-walled (c. 0.5 µm), smooth, hyaline, varying greatly in shape, usually Y-shaped, but also triangular, T-, club-, boomerang-shaped, or somewhat ramified, with two rounded and widened branches and one gradually narrowing to pointed branch, 10–16(–20) µm long and, on the average, 2.5–3 µm wide. Germination of conidia (Fig. 12; comp. also Ingold, 1987) results in hyphae on which both blastic conidia and ballistospores are formed, like those produced from the germination of basidiospores. *Ballistospores* on MYP produce rod-shaped and Y-shaped blastic conidia, and also abundant ballistospores. *Rod-shaped conidia* may produce Y-shaped conidia or hyphae bearing ballisto-

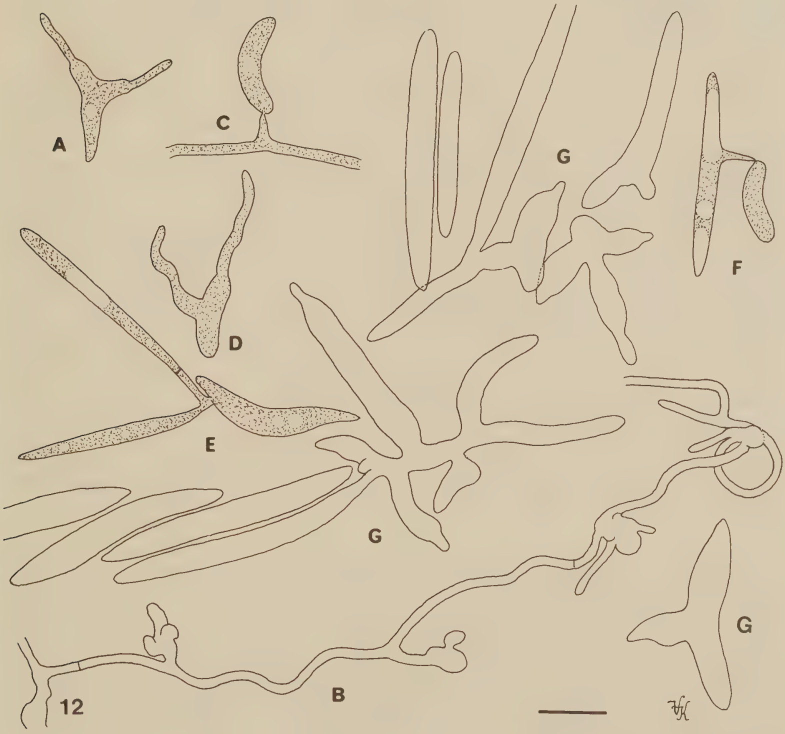

Fig. 12. Culture of germinated conidia of *C. ayresii*. A) Germinating Y-shaped conidium. B) Ramified, septate hypha. C) Ballistospore arising from the hypha. D) Ballistospore germinating by hyphae. E) Ballistospore germinating by rod-shaped conidia. F) Rod-shaped conidium giving rise to ballistospore. G) Rod-shaped and Y-shaped conidia. (Bar = 10 µm).

spores, Y-shaped and rod-shaped conidia. Balls of conidia were formed in culture of basidiospores by repetition of Y-shaped conidia (Fig. 11 I). In cultures of basidiospores on MYP, after 3 weeks, inflated, globose or ellipsoidal, hyaline, thin-walled cells were seen (Fig. 11 J), which could be initials of spores and/or sterile cells. Ballistospores and Y- and rod-shaped conidia in cultures are mononucleate. Hyphal cells, with widely-spaced cross walls and nuclei, are probably also mononucleic. Septal pore is a Tilletia-type, dolipore without pore caps (Fig. 8).

Conidiosporomyces ayresii is known on Hyparrhenia, Panicum and Setaria species (Gramineae) from the tropics in Africa, Asia and America. It was reported on Hyparrhenia subplumosa Stapf, Panicum coloratum L., P. laevifolium Hack., P. maximum Jacq., P. megastachyum Nees, P. parvifolium Lam. (P. umbellatum Trin.), Setaria longiseta Beauv., S. pumila (Poir.) Roem. & Schult. (S. pallide-fusca (Schum.) Stapf & C. E. Hubbard), S. sphacelata (Schumach.) Moss, its var. aurea (A. Br.) W. D. Clayton (S. aurea A. Br.; S. trinervia Stapf), and var. sericea (Stapf) W. D. Clayton (S. tenuispica Stapf & C. E. Hubbard).

DISCUSSION

Typical for Conidiosporomyces are: 1) The asymmetrical, anisomorphic, sac-like, apically open sorus (comp. also Viennot-Bourgin, 1951) with a membrane composed of an external layer of host tissue and, extending half-way up the sorus, an internal layer of sporogenous fungal tissue. The sori are filled with a grey to pale olivaceous-brown, semi-powdery mass of spores, sterile cells and loose balls of conidia. Columella lacking. 2) The spores are variable in size and ornamentation. 3) The relatively thick-walled, ornamented, coloured spores germinate to produce aseptate basidia with a relatively small number (10–24) of apical, elongated basidiospores which germinate without conjugation. 4) The nearly colourless, large sterile cells are ornamented. 5) The presence of peculiar, Y-shaped, thin-walled, hyaline conidia which are forming loose balls between the relatively thick-walled spores and sterile cells. 6) Germination of conidia results in hyphae on which both blastic conidia and ballistospores are formed. 7) Unique cultural characters: hyphae from both basidiospores and Y-shaped conidia can produce ballistospores, Y-shaped and rod-shaped conidia. Each of these (ballistospores, Y-shaped and rod-shaped conidia) can give rise to any of these three forms. 8) The presence of the sori in only some ovaries of an inflorescence probably denotes a local infection. 9) Host–parasite interaction by intercellular hyphae, haustoria lacking. 10) The septal pore structure is of Tilletia-type (dolipore without pore caps), similar to that of Tilletia and Neovossia species.

The similar septal pore and host–parasite interaction types denote a close relationship of Conidiosporomyces with Tilletia and Neovossia, two genera with a generic delimitation unsatisfactorily studied. (Therefore, in this paper, the characters of Tilletia and Neovossia refer to their type species: Tilletia caries (DC.) L.-R. & C. Tul., and Neovossia moliniae (Thümen) Körnicke, respectively; comp. also Vánky, 1987:6, 82 & 112). Furthermore, germinating spores of C. ayresii exhibit a mixture of Tilletia and Neovossia characters. The relatively small number of relatively wide basidiospores is a Tilletia character (in Neovossia a large number, up to 80 or more, of acicular basidiospores are produced), whereas germination of basidiospore without conjugation is a Neovossia character (in Tilletia basidiospores germinate after conjugation). Other features Conidiosporomyces has in common only with Neovossia, but not with Tilletia. The typical trimethylamine smell of the spore masses of (all?) Tilletia species is lacking in Conidiosporomyces ayresii and Neovossia species. The infection of Tilletia species is systemic, all caryopses of an inflorescence being affected, while in Neovossia and Conidiosporomyces it is probably a local infection, affecting only some of the seeds in the inflorescence.

However, several important characters differentiate *Tilletia ayresii* not only from *Tilletia* and *Neovossia* but also from all other known smut genera, justifying the proposal of a separate genus. 1) Most important character, unique to *Conidiosporomyces*, is the presence of balls of "Y-shaped" conidia in the sori between the spores and sterile cells. 2) The great form-variability of Y-shaped conidia is also typical. 3) Basidiospores in culture produce ramified, septate hyphae on which not only ballistospores but also blastic conidia (rod- and Y-shaped) and balls of conidia are formed. The ballistospores and conidia in their turn yield hyphae, ballistospores or conidia. 4) It is also unique to *Conidiosporomyces* that the conidia behave like basidiospores: they germinate by hyphae on which both ballistospores and blastic conidia are formed. 5) The "ab ovo" open sori with an apical aperture and thickened basal part with inner layer of sporogenous fungal tissue are other characters of *Conidiosporomyces*. Both *Tilletia* and *Neovossia* species (with a few exceptions) form "bunt balls" with a uniform structure, lacking the apical aperture. 6) The presence of a great number of ornamented sterile cells between the spores of *Conidiosporomyces* is also typical; in *Tilletia* and *Neovossia* species sterile cells are relatively few or lacking and commonly smooth. 7) The size, colour and ornamentation of the spores are rather uniform in *Tilletia* and *Neovossia* species but variable in *Conidiosporomyces*.

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LITERATURE CITED

Ainsworth, G. C. 1941. Contributions towards the fungus flora of Uganda. IV. The Ustilaginales of Uganda. - Proc. Linn. Soc. London 153:92-97.

Bauch, R. 1938. Ueber die systematische Stellung von *Tilletia sphagni* Nawaschin. - Ber. Deutsch. Bot. Ges. 56:73-85.

Duran, R. & Fischer, G. W. 1961. The genus *Tilletia*. - Washington State University, 138 pp.

Hennings, P. 1895. Basidiomycetes. In Engler, A. (editor). Die Pflanzenwelt Ost-Afrikas und der Nachbargebiete. Teil C. - Berlin, 1895.

Ingold, C. T. 1987. Ballistospores and blastic conidia of *Tilletia ayresii*, and comparison with those of *T. tritici* and *Entyloma ficariae*. - Trans. Brit. Mycol. Soc. 88:75-82.

Kukkonen, I. & Hyytiäinen, R. 1969. A method for sterilizing spores of *Anthracoidea* (Ustilaginales) and the effect of sterilization on spore germination. - Ann. Bot. Fenn. 6:243-254.

Ling, L. 1953. Taxonomic notes on the Ustilaginales III. - Sydowia 7:151-157.

Massee, G. E. 1899. A revision of the genus *Tilletia*. - Bull. Misc. Inform. 1899:141-159.

Vánky, K. 1987. Illustrated genera of smut fungi. - Cryptogamic Studies 1:1-159 (ed. W. Jülich). Gustav Fischer Verlag. Stuttgart/New York.

Viennot-Bourgin, G. 1951. Étude morphologique de quelques lésions charbonneuses des végétaux. - Ann. Épiphyt. 1951:456-478.

Zundel, G. L. 1938. The Ustilaginales of South Africa. - Bothalia 3:283-330.

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TECTACERVULUS MAHONIAE, KABATINA MAHONIAE, and SELENOPHOMA MAHONIAE, Three New Fungi on MAHONIA REPENS

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Abstract: *Tectacervulus mahoniae* gen. et sp. nov., has hypophyllous, light-colored acervuli which remain permanently covered by unruptured epidermis, irregularly lageniform conidiogenous cells, and hyaline, aseptate, fusiform conidia bearing a tongue- to fan-shaped, mucilaginous basal appendage. Leaf lesions with acervuli undergoing active conidiogenesis were noted in early spring. *Kabatina mahoniae* sp. nov., has amphigenous, dark acervuli bearing brown, septate, branched conidiophores with cylindrical-clavate conidiogenous cells, and hyaline, aseptate, cylindrical-ellipsoid conidia. The cultural synanamorph form is *Hormonema*-like. Leaf lesions bearing conidiomata undergoing active conidiogenesis were discovered in the fall. *Selenophoma mahoniae* sp. nov., has amphigenous, pycnidial conidiomata with conidiogenous cells bearing 1-7 conidiogenous apertures. The conidia are aseptate, hyaline to yellowish, and falcate to ellipsoid. The cultural synanamorph form is *Aureobasidium*-like.

Introduction: Leaves of *Mahonia repens* (Lindley) Don were collected in the mountains of southwestern Colorado from spring through fall. Three new fungi were discovered, none of them 'leaf spot,' which is caused by *Phyllosticta* spp. in the U. S. A. (5).

Collections from three sites from mid May through early June had light-brown lesions on leaflets that had overwintered from the previous season, but were attached to the plant and green. New leaves were just appearing on the host at the site of the mid-May collection. A novel acervular coelomycete with hyaline, aseptate conidia bearing tongue- to fan-shaped basal appendages was found in the lesions. The fungus is described herein, and accommodated in a new genus, *Tectacervulus*.

In the fall, collections at several sites along a trail yielded a second new taxon, *Kabatina mahoniae*. This fungus was associated with large, light- to medium-brown spots usually bordered by narrow, dark-brown to purple, red, and sometimes chlorotic yellow bands.

A third new fungal species, *Selenophoma mahoniae*, was discovered on leaflets collected in midsummer. Conidiomata were found on dead spots on living leaflets from new and old growth, but the spots were too variable to make their description of value in recognizing the fungus.

Tectacervulus gen. nov.

Conidiomata acervula, subepidermalia, aggregata, ex cellulis tenuiparietibus composita, saepe coalescentia, remanentia tecta sub epidermide intacta. Conidiophora hyalina, levia, plerumque ex 2 cellulis conidiogenis super 1 cellula sterili composita. Cellulae conidiogenae determinatae, integratae, elongatae-lageniformes, hyalinae, leves. Ontogenesis conidiorum holoblastica per constructionem parietis apicalis; maturatio et ontogenesis conidiorum synchronae; proliferatio cellularum conidiogenarum enteroblastica, conidia additia circa eodem puncto producens. Conidia hyalina, aseptata, tenuiparietes, fusiformia, recta vel curvata, base saepe appendicem mucilaginam lingulatam vel flabellatam ferenti.

Conidiomata acervular, subepidermal, aggregated, composed of thin-walled cells, often coalesced, remaining hidden beneath the intact epidermis. Conidiophores hyaline, smooth, usually consisting of two conidiogenous cells on one sterile cell. Conidiogenous cells determinate, integrated, elongate-lageniform, hyaline, smooth. Conidial ontogeny holoblastic by apical wall building, maturation synchronous with conidial ontogeny; conidiogenous cell proliferation enteroblastic to produce additional conidia at the same level. Conidia hyaline, aseptate, thin-walled, fusiform, straight or curved, base often bearing a tongue- to fan-shaped mucilaginous appendage.

Sp. typ.: *Tectacervulus mahoniae*, Fig 1.

Maculae manifestae utrinque foliolorum, brunneae pallidae vel pallidae cinereae-brunneae ante et tempore formantium acervulorum, atrocinereae-brunnescentes ubi acervuli maturissimi; immarginatae vel marginibus atrocinereis-brunneis, interdum halonnatae luteae; usque ad 2 cm diam, saepe coalescentes et folium integrum involventes. Conidiomata acervula, perpallida bubalina, hypophylla, subepidermalia, aggregata, ex cellulis tenuiparietibus composita, primo in centro maculae et postea versus marginem formata, usque ad 250 μm diam sed saepe coalescentia et apparentia grandiora, remanentia tecta sub epidermide intacta; massulae siccae conidiorum aureae pellucidae, humidae cremeae. Conidiophora hyalina, levia, plerumque ex 2 cellulis conidiogenis super 1 cellula sterili composita. Cellulae conidiogenae determinatae, in conidiophoris incorporatae, elongatae-lageniformes, hyalinae, leves, 12-32 μm longae, 2-4 μm crassae base et 1-1.5 μm crassae apice, canalibus perangustis, collis ca 1 μm longis, aliquantum *latis factis. Conidia hyalina, aseptata, tenuiparietes, fusiformia, recta vel curvata, apice plerumque rotundato, base angusta truncata, 7-13(-22) x 1-1.5(-2) µm, base saepe appendicem mucilaginam lingulatam vel plus minusve flabellatam usque ad 3 µm longa ferenti, per stomata in epidermide irrupta inrupta evadentia.*

Holotypus: Ex foliis *Mahonia repens* (Lindley) Don, Jones Creek Trail, ca 2 miles ex initio, La Plata Co., CO., U.S.A., Annette W. Ramaley, 17 May 1989, BPI 1107358.

Spots visible on both sides of the leaflets, light brown to light gray-brown before and during acervulus formation, becoming darker gray-brown where acervuli are oldest; unbordered or the margin darker gray-brown, sometimes surrounded by a yellow halo; up to 2 cm diam, often coalescing and the entire leaf involved. Conidiomata (Fig. 1, c) acervular, light buff, hypophyllous, subepidermal, aggregated, composed of thin-walled cells, formed first at the center of the lesion and then proceeding outward, up to 250 µm diam but often coalesced and apparently larger, remaining hidden beneath the intact epidermis; conidial masses transparent golden when dry, cream-colored when moist. Conidiophores hyaline, smooth, usually consisting of 2 conidiogenous cells on 1 sterile cell. Conidiogenous cells (Fig. 1, b) determinate, integrated, irregularly elongate-lageniform, hyaline, smooth, 12-32 µm long, 2-4 µm wide at the base and 1-1.5 µm wide at the apex, channel very narrow, collarette ca 1 µm long, somewhat flared. Conidia (Fig. 1, a) hyaline, aseptate, thin-walled, fusiform, straight or curved, apex usually rounded, base narrowly truncate, 7-13(-22) x 1-1.5(-2) µm, base often bearing a tongue- to more or less fan-shaped mucilaginous appendage up to 3 µm long, escaping through the stomata in the unruptured epidermis.

Conidia taken from acervuli undergoing active conidiogenesis were spread on potato dextrose agar (PDA), but no growth occurred.

The conidiogenous cells are typical 'phialides' and conidiogenesis would once have been termed enteroblastic. However, it is preferable now to separate conidial ontogeny from conidiogenous cell proliferation. Following the reassessment of phialides by Minter, Kirk & Sutton (8, 9), and Minter, Sutton & Brady (10), conidial ontogeny for the phialides of *Tectacervulus* should be viewed as holoblastic for all conidia, not just the first, and conidiogenous cell proliferation should be considered enteroblastic in a manner leading to formation of successive conidia at approximately the same level on the conidiogenous cell.

Conidiogenous cells of *Tectacervulus* are often bent and irregularly swelled, though overall they are elongate lageniform. Productive conidiogenous cells sometimes form small lateral branches on normal-sized conidiogenous cells (Fig. 1, b) although they are generally found in pairs on a subtending cell.

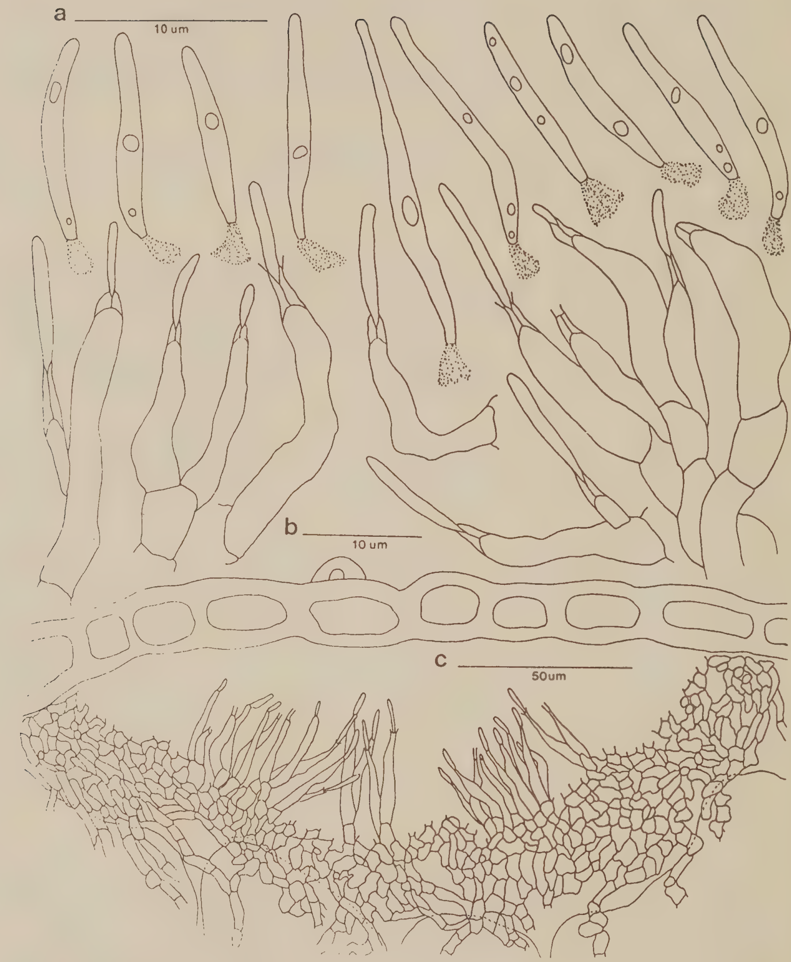


Figure 1. *Tectacervulus mahoniae.* a) conidia with basal appendages; b) conidiogenous cells; c) sub-epidermal conidioma.

The channel is narrow and quite long (2-3 μm), and the collarette flared when spores are being produced (Fig. 1, b).

The appendage on a *Tectacervulus* conidium (Fig. 1, a) is difficult to observe with normal light optics, but easily seen with phase optics. Many conidia adhere to the microscope slide, cover glass, and the host epidermis by means of the sticky basal appendage.

Tectacervulus is unique in its combination of aseptate, fusiform conidia with basal, tongue- to fan-shaped, mucilaginous appendages, elongate, irregularly lageniform conidiogenous cells, and light-colored, hypophyllous acervuli which remain permanently covered by the unruptured epidermis. Thus, *Tectacervulus* can be separated easily from the acervular or stromatic foliicolous fungi with aseptate, hyaline conidia previously recorded on *Mahonia* or *Berberis* (Table 1). These include 3 species of *Gloeosporium, Colletotrichum mahoniae* Fabricatore, *Cylindrosporium berberidis* Lucas et Camara, *Blennoria patagonica* Spegazzini, and *Melasmia berberidis* Thümen et Winter. The description of *Gloeosporium aecidiicola* Ranojevic led von Arx (1) to conclude it may belong to *Tuberculina persicina* (Ditmar) Saccardo, a fungus associated with rust aecia; *G. berberidis* Cooke was referred to *Kabatiella* (1), a genus with multiple conidiogenous loci on its clavate or apically rounded conidiogenous cells; and the description of *G. japonicum* Hemmi led to its identification as *Colletotrichum gloeosporioides* (Penzig) Saccardo, the conidial state of *Glomerella cingulata* (Stoneman) Spaulding et Schrenk (1). Variation in the acervuli of this *Colletotrichum* is genetically, physiologically, and substrate dependent (1), but the host epidermis consistently is broken and the conidia are broader than those of *Tectacervulus*, and form reddish to pink or gray (not creamy to golden) slimy drops in mass. In contrast to *Tectacervulus*, *Colletotrichum mahoniae* is found on gray spots 1-1.5 mm diam, and forms salmon-colored conidial masses on dark acervuli which sometimes have setae (3). The amphigenous acervuli, cylindrical conidiogenous cells 5-8 μm long, and cylindrical or clavoid conidia of *Cylindrosporium berberidis* (6) easily distinguish that fungus from *Tectacervulus.* The dark, locular, stromatic conidiomata of *Blennoria patagonica* (13, 14), which burst through the epidermis, and *Melasmia berberidis* (14, 15), which are mostly epiphyllous, are easily separated from the light-tan, hypophyllous acervuli of *Tectacervulus* which remain below the unbroken epidermis. In addition, among these genera, only *Tectacervulus* has conidia with a mucilaginous appendage.

The mucilaginous appendage on a *Tectacervulus* conidium gives it an apparent similarity to conidia of several genera. Distinguishing characteristics are summarized in Table 2. The mucilaginous appendage of *Ceuthospora*, *Strasseria*, *Apostrasseria* (12) and *Rhabdogloeum* (11), is born at the conidial apex, while that of *Tectacervulus* is at the conidial base. *Apostrasseria* has a basal appendage like its apical appendage, or the basal appendage may be small and inconspicuous. *Rhabdogloeum* conidia are relatively broad, dumbbell-shaped or cylindrical, and bear a filiform apical appendage in contrast to *Tectacervulus* conidia which are narrower, fusiform, and bear a tongue- to fan-shaped basal appendage. Conidiomatal characters also distinguish these fungi from *Tectacervulus.* *Strasseria* and *Apostrasseria* have dark, stromatic, pycnidioid conidiomata with irregular locules and a

TABLE 1. TRAITS DISTINGUISHING SOME FUNGI FOUND ON *BERBERIS* OR *MAHONIA.*

	Conidiophores/ Conidiogenous cells	CONIDIOMA			Massed Conidia	Special Characters
		Position	Color	Type		
*B. p.**	....	hyp	dark	stromatic, loc	....	....
Coll. g.	hy tip, some septate, cylindric	....	light/ dark	acervulus	pink, reddish	appressoria
Coll. m.	hy, 23-24µm	amphigenous	dark	acervulus	salmon	....
Cyl. b.	hy, 5-8µm	amphigenous	dark	acervulus	....	....
K. b.	hy, some septate, clavate, polyblastic	hyp (epi)	light	acervulus sporodochium	....	*Aureobasidium* in culture
Kab. m.	brown, subclavate-cylindric,monoblastic	hyp (epi)	dark	acervulus sporodochium	white	*Hormonema* in culture
M. b.	hy, 12-18µm	epi (hyp)	dark	stromatic, loc	....	....
Sel.m.	hy-brown,polyblastic	amphigenous	dark	pycnidial	lt. brown	*Aureobasidium* in culture
Tect. m.	hy, lageniform 12-32µm	hyp	light	acervulus	cream-gold	acervulus hidden
Tub. p.	....	....	....	....	....	on rust aecia

**B.p.=Blennoria patagonica, Coll.g.=Colletotrichum gloeosporioides, Coll.m.=Colletotrichum mahoniae, Cyl.b.=Cylindrosporium berberidis, K.b.=Kabatiella berberidis, Kab.m.=Kabatina mahoniae, M.b.=Melasmia berberidis, Sel.m.=Selenophoma mahoniae, Tect.m.=Tectacervulus mahoniae, Tub.p.=Tuberculina persicina;* epi=epiphyllous, hy=hyaline, hyp=hypophyllous, loc=locular.

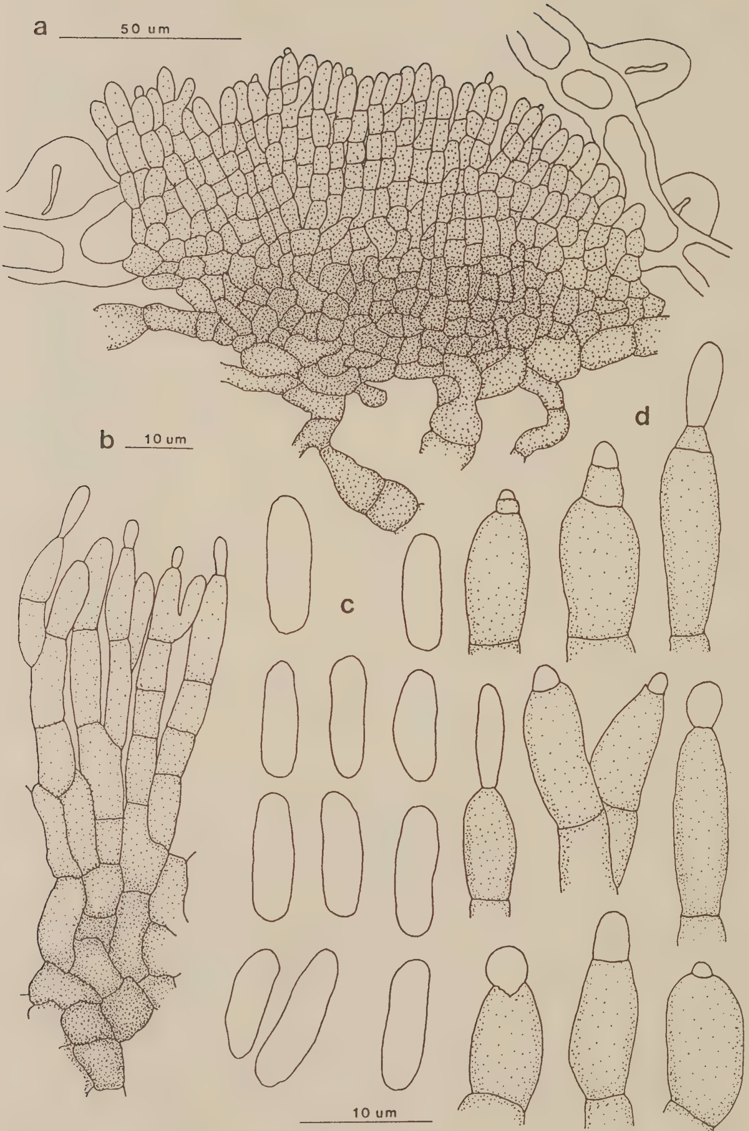
single ostiole. *Ceuthospora*'s pseudostromatic conidiomata are dark, multilocular, and pycnidioid, and may have an ostiole for each locule, or all locules may empty into a common pore. *Rhabdogloeum* has light-colored, amphigenous acervuli, but they are linear, and exposed by rupture of the epidermis and cuticle. *Tectacervulus* conidiomata are, in contrast, hypophyllous, light-tan, more or less circular acervuli which are not exposed by rupture or peeling away of the epidermis and cuticle.

TABLE 2. ACERVULAR-STROMATIC FUNGI WITH HYALINE, ASEPTATE CONIDIA BEARING A MUCILAGINOUS APPENDAGE(S)

	Conidial Appendage	CONIDIOMA		
		Color	Ostiole	Form
Tectacervulus	base	light	-	acervulus, circular
Apostrasseria	apex,base	dark	1	pycnidioid
Ceuthospora	apex	dark	1 or1/ locule	pycnidioid
Rhabdogloeum	apex	light	-	acervulus, linear
Strasseria	apex	dark	1	pycnidioid

Kabatina mahoniae, sp. nov., Fig 2.

Maculae manifestae utrinque foliolorum, brunneae pallidae vel fuscatae, plerumque circumcinctae a atrobrunneis vel purpureis, rubris, et extimis, interdum, flavovirentibus zonis angustis. Maculae usque ad 3 cm diam, dimidium vel prope totorum foliolorum obducentes. Acervuli typici atrati una cum maculis sed non maculis omnibus consociati. Ubi adsunt, acervuli prope totam vel partem parvam maculam occupantes, ad locum peculiarum in macula non restricti. Mycelium immersum, cinereascens-atrum, ramosum, septatum, 3-12 μm crassum. Conidiomata acervuli, aliquantum pulvinata, erumpentia, amphigena sed maximam partem hypophylla, subepidermalia vel epidermalia, separata vel confluentia, base ex cinerascenti-atra, crassipariete textura angulari composita, plano conidiophororum brunnescentia, 50-400 μm diam. Dehiscentia per epidermidem et cuticulam rumpentes irregulariter. Massulae conidiorum albae. Conidiophora levia, brunnea, pallidiora versus apicem, septata, plano ullo secus longitudinem ramosa, usque ad 65 μm longa. Cellulae conidiogenae in conidiophoris incorporatae, brunnea pallida, cylindratae vel subclavatae,


a
50 um
b
10 um
c
d
10 um

leves, crassiebus periclinatis notatis carentes, collis carentes, 3-6 x 6-19 μm. Ontogenesis conidiorum holoblastica per constructionem parietis apicalis; maturatio et ontogenesis conidiorum synchronae; proliferatio cellularum conidiogenarum enteroblastica, conidia addititia circa eodem puncto producens, vel, raro, proliferatio cellularum conidiogenarum enteroblastica conidia addititia punctis successivis altioribus producens. Conidia acrogena, hyalina, aseptata, cylindrata-ellipsoidea, levia, tenuiparietibus, apicibus et basibus rotundatis obtusis vel basibus truncatis cicatricibus indistinctis, 6.5-12.5 x 2.5-3.5 μm.

Holotypus: ex foliis vivis Mahonia repens (Lindley) Don, ca 0.25 mile ex initio, Haflin Creek Trail #1557, La Plata County, CO., U.S.A., Annette W. Ramaley, October 10, 1989, BPI 1107359.

Lesions visible on both sides of the leaflets, light to medium brown, usually bordered by narrow bands of dark brown to purple, red, and outermost, sometimes, chlorotic yellow. Spots up to ca 3 cm diam, covering half to nearly entire leaflets. Characteristic dark acervuli associated with the lesion, but not present on every lesion. When present, acervuli occupying nearly all to only a small part of a lesion, not restricted to a particular location in the lesion. Mycelium immersed, gray-black, branched, septate, 3-12 μm wide. Conidiomata (Fig. 2, a) acervular, somewhat pulvinate, erumpent, amphigenous but mostly hypophyllous, subepidermal to epidermal, separate or confluent, formed of gray-black rather thick-walled textura angularis at the base, changing to brown at the level of the conidiophores, 50-400 μm diam. Dehiscence by irregular rupture of the cuticle and epidermis. Conidial masses white to sordid. Conidiophores (Fig. 2, b) smooth, brown, lighter colored toward the apex, septate, branched at any level along the length, up to 65 μm long. Conidiogenous cells (Fig. 2, d) integrated, pale brown, smooth, cylindrical to subclavate, periclinal thickening absent, collarette absent, 6-19 x 3-6 μm. Conidial ontogeny holoblastic by apical wall building, maturation synchronous with conidial ontogeny, conidiogenous cell proliferation enteroblastic to produce additional conidia at ca the same level, or, rarely, conidiogenous cell proliferation enteroblastic to produce additional conidia at successively higher levels. Conidia (Fig. 2, c) acrogenous, hyaline, aseptate, cylindrical-ellipsoidal, smooth, thin-walled, apex and base bluntly rounded or the base truncate at the indistinct scar, 6.5-12.5 x 2.5-3.5 μm.

Conidia taken from a single conidioma with a sterile needle were suspended in a drop of sterile tap water and spread over the surface of PDA in a petri plate. In addition, spots: a) with sporulating conidiomata, b) with conidiomata still below the epidermis, and c) without conidiomata, were surface dis-

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Figure 2. *Kabatina mahoniae.* a) conidioma; b) details of conidiophore branching; c) conidia; d) conidiogenous cells with and without annellations. In one example, the brown wall layer appears to have been torn by the emerging conidium.

infested with 70% alcohol or 9 parts water:1 part household bleach. For each leaf, four or five small adjacent pieces of tissue were aseptically removed and placed on PDA in a petri plate.

Some tissue samples from each leaf produced fungal growth like that from the conidia indicating presence of the fungus within the characteristic spots even when conidiomata had not developed. However, a similar, faster-growing fungus also grew out of some pieces of tissue from each leaf making it impossible to assign even probable responsibility for lesion production to one of the fungi. The cultural synanamorph for the fungus found only in leaf tissue resembles *Aureobasidium pullulans* (de Bary) Arn. var. *pullulans* (5) which was originally described by de Bary as a common saprophyte on the surface of phanerogams. The cultural synanamorph for the fungus from conidia on the conidiomata, as well as from leaf tissue, is *Hormonema*-like (Fig. 3): Colonies smooth, covered with slimy masses of conidia; initially cream-colored but rapidly becoming greenish black. Hyphae hyaline, quickly browning, brown pigment also present external to the cells; 1.5-16 μm broad with cells commonly broader than long, later often with longitudinal and oblique septa. A tough pellicle forming on older colonies consisting of the masses of conidia, hyphae, and intertwined short hyphae from germinated conidia. Lateral hyphal growth scarcely exceeding the margin of the moist covering of conidia until darkening has occurred, then proceeding via a band up to ca 5 mm wide of distally-darkening, cream-colored mycelium beneath and on the surface of agar, the raised darkened pellicle becoming centrally located on the expanding, mostly sterile mycelium of the colony. Conidiogenous cells on hyaline and brown hyphae, terminal or intercalary, bearing one or occasionally two asynchronously active conidiogenous loci consisting of a specialized area continuous with the cell surface, a small protuberance scarcely 1 μm wide and long, a protuberance ca 1 μm wide and up to several μm long, or a more or less ampulliform lateral outgrowth, cell, or short branch separated by a basal septum from the cell on which it is born (Fig. 3, a); conidial ontogeny holoblastic by apical wall building, maturation synchronous with conidial ontogeny, conidiogenous cell proliferation enteroblastic to produce additional conidia at successively higher levels forming visible annellations on the conidiogenous loci, or, since annellations often cannot be seen at loci known to have produced more than one conidium, conidiogenous cell proliferation enteroblastic to produce additonal conidia at about the same level. Conidia (Fig. 3, c) hyaline, aseptate, cylindrical-ellipsoidal, apex and base bluntly rounded or the base truncate at the indistinct scar, thin-walled, smooth, very variable in size, 4-19 x 2.0-5.5 μm, conidia produced by a specific locus approximately the same size (Fig. 3, a); secondary conidia rapidly forming anywhere along the primary conidia but more often at one or both ends (Fig. 3, b). More conidia formed on conidial than hyphal conidiogenous loci in young colonies; when lateral expansion beyond the margin of the pellicle is occurring, there is relatively little conidiogenesis and that present is mostly on conidiogenous loci on the mycelium; endoconidia not observed. Liberated conidia may swell, become

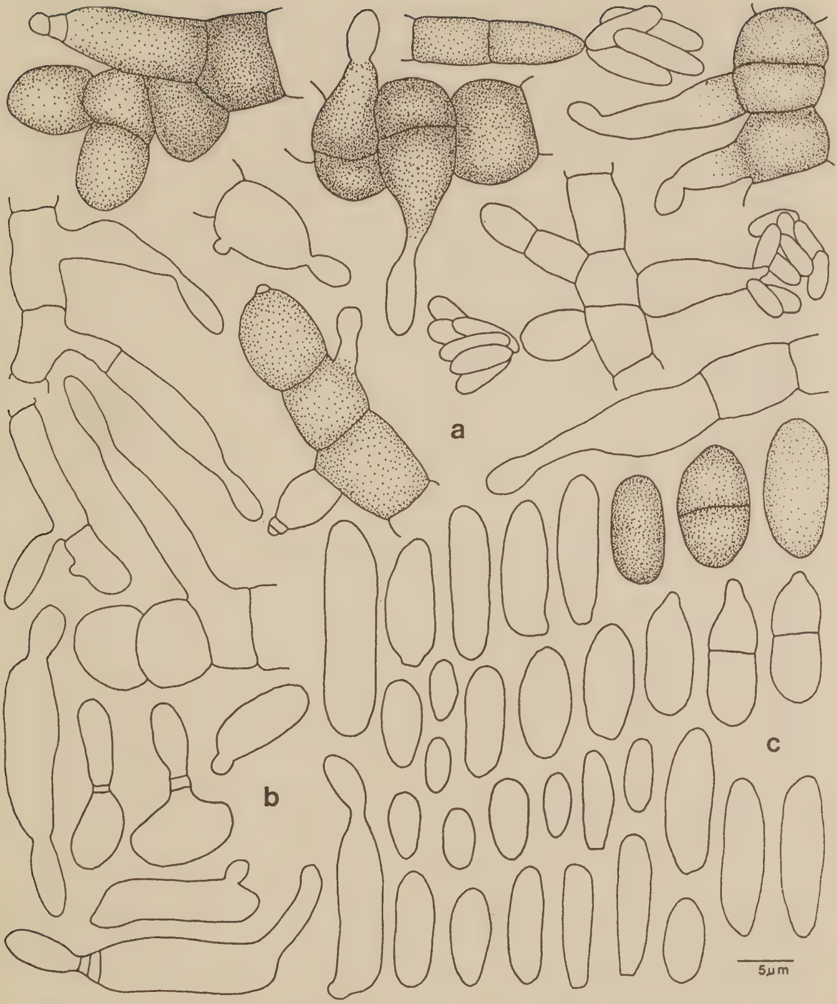

Figure 3. *Hormonema* cultural synanamorph state of *Kabatina mahoniae.* a) Conidium production; b) secondary conidium production; c) conidia.

brown and often become 2-celled (Fig. 3, c).

This new fungus is considered a species of *Kabatina* because it has the epidermal to subepidermal, pulvinate, dark, acervular-sporodocial conidiomata of that genus (2, 14), and cylindrical-ellipsoid, hyaline, aseptate conidia produced on phialides. The cultural synanamorph form, *Hormonema*, is characteristic of *Kabatina* species. However, *Kabatina mahoniae* differs from other *Kabatina* species in its lack of collarette and periclinal wall thickening on the conidiogenous cells which are colored, not hyaline. In addition, *K. mahoniae* conidiophores are seen to be closely-packed, septate, and branched at any level instead of "rarely branched, 1-septate" (14). Conidiogenesis is more variable in *K. mahoniae* than in other *Kabatina* species. Although conidiogenesis in *K. mahoniae* generally takes place on conidiogenous cells which act as phialides, percurrent proliferation occasionally occurs and the conidiogenous cells act as annellides (Fig. 2, d). The same is almost certainly true of the *Hormonema* state of the fungus where annellations are sometimes observable, but large groups of spores may be produced at a conidiogenous locus with no visible elongation of that locus (Fig. 3, a, b). Conidiogenesis might, therefore, be described as both enteroblastic/phialidic and, less commonly, holoblastic/annellidic. However, after the re-evaluation of conidiogenesis in general, and phialides in particular, by Minter, Kirk, & Sutton (7, 8), and Minter, Sutton, & Brady (9) it is preferable now to describe conidiogenesis in this species as holoblastic, and conidiogenous cell proliferation as enteroblastic. The difference in elongation of the conidiogenous cells between production of successive conidia accounts for the different appearance of phialides and annellides.

Kabatina is not likely to be confused with any of the genera with aseptate hyaline conidia previously recorded on *Mahonia* or *Berberis* (Table 1.). *Tuberculina persicina (=Gloeosporium aecidiicola*) is associated with rust aecia (1), *Kabatiella berberidis* (=*Gloeosporium berberidis*) has multiple conidiogenous loci on the conidiogenous cells (1, 10), and *Cylindrosporium berberidis* has hyaline conidiogenous cells only 5-8 μm in length (6), characters not shared by *Kabatina*. *Blennoria patagonica* (13, 14) and *Melasmia berberidis* (14, 15) both have eustromatic, locular conidiomata which realily separates them from *Kabatina*. In contrast to *Kabatina*, *Colletotrichum mahoniae* is associated with small spots, may have setae, and the conidial masses are salmon-colored (3). *Gloeosporium japonicum* was identified as the conidial state of *Glomerella cingulata*, *Colletotrichum gloeosporioides* (1). It may be, therefore, widely variable as to structure, color, and presence or absence of setae, but the spores are generally broader than those of *Kabatina*, and spore masses form reddish or pink slimy drops (1). More importantly, perhaps, *Colletotrichum gloeosporioides* cultures do not form a *Hormonema* conidial state, nor does *Kabatina* form appressoria.

Selenophoma mahoniae, n. sp., Fig. 4.

Conidiomata pycnidia, separata vel aggregata, immersa sed interdum apparenter superficialia in substratis veteribus, depressa globosa ad elongata, interdum confluentia, prime super venas folii, amphigena sed plerumque visa primum in superficie folii, epidermalia ad subepidermalia, atrobrunnea, unilocularia, 50-225 μm diam usque ad 900 μm longa in conidiomatibus confluentibus; parietes ex textura angulari magnis-cellulis, brunneis, crassiparietibus compositi. Ostiolo carens; dehiscentia per parietem superum *rumpentem irregulariter. Conidiophoris carentia. Cellulae conidiogenae discretae, determinatae, subhyalinae ad pallidas brunneas, leves, 1-7 aperturis apparenter monosporis, usque ad 27 x 13 μm, ex cellulis interioribus conidiomatum et gradatim ex cellulis versus peripheriam usque ad 2-3 strata cellularum a pagina inferiore, ex omnis stratis superficialibus formatae, cellulae conidiogenae permanentes non visae. Conidia aseptata, falcata ad ellipsoidea, levia, tenuiparietes, hyalina ad flavida, 5.5-13.5 x 2-5 μm. Cirri pallidi brunnei.*

Holotypus: Ex foliis *Mahonia repens* (Lindley) Don, ca 1 mile ex Junction Creek Road, ca 12.8 miles ex limite San Juan National Forest, La Plata Co., CO., U.S.A., Annette W. Ramaley, 27 July 1990, BPI 1107357.

Conidiomata pycnidial (Fig. 4, b), separate or aggregated, immersed but sometimes appearing superficial on old substrata, depressed globose to elongate, sometimes confluent, especially over leaf veins, amphigenous but commonly appearing first on the upper surface of the leaf, epidermal to subepidermal, dark brown, unilocular, 50-225 μm diam and up to 900 μm long in confluent conidiomata; walls composed of large-celled, brown, thick-walled textura angularis. Ostiole absent; dehiscence by irregular rupture of the upper wall. Conidiophores absent. Conidiogenous cells (Fig. 4, b) discrete, determinate, nearly hyaline to pale brown, smooth, with 1-7 apparently monosporous apertures, up to 27 x 13 μm, formed from interior cells of the conidiomata and progressively from cells toward the periphery to within 2-3 cell layers of the lower surface, including all layers of the upper surface, permanent conidiogenous cells not seen. Conidia (Fig. 4, a) aseptate, falcate to ellipsoid, smooth, thin-walled, hyaline to yellowish, 5.5-13.5 x 2-5 μm. Cirri pale brown.

Conidia were removed from a single conidioma of fresh or dried material with a sterile needle, suspended in sterile tap water on a plate of PDA, and spread over the surface of the agar. Growth of only one fungus resulted. Actively growing cultures emitted a strong 'yeasty' odor. The fungus exhibited the following *Aureobasidium*-like synanamorph (Fig. 5): Colonies spreading, smooth, covered with slimy masses of conidia; cream colored early, pinkish when older, in age sometimes becoming blackened at the periphery and in more or less radial patches on the surface. Hyphae hyline, of limited growth and tending to break up into individual, large, often rounded cells or short series of rounded cells on the agar surface, up to 21 μm wide; maintaining the integrity of the filament below the agar surface, major branches 8-16 μm wide, lesser branches down to 3.5 μm wide; often becoming dark and thick-walled at the periphery of the colony in old cultures. Conidiogenous loci (Fig. 5, a) usually on hyline cells but occasionally on brown cells, terminal, intercalary, or lateral on a protrusion with or without a basal septum; when terminal or lateral, conidiogenous areas scarcely inflated beyond the diameter of the hypha, up to 90 x 6.5-12.5 μm or broader, especially when cells on the agar surface are conidiogenous. Conidia (Fig. 5, f) blastic, produced simultaneously over a single conidiogenous cell (Fig. 5, a, b), hyaline, smooth, one-celled, cylindrical with bluntly rounded ends, cylindrical with bluntly rounded ends and a constricted middle, or some falcate in cultures several days old, mostly 11-17 x 4-6 μm at the time of release from the conidiogenous cells or at production of one or more secondary conidia from the distal end, increasing in size after release. Secondary conidia formed anywhere along free primary conidia (Fig. 5, b), but most often originating at one or both ends, below the agar surface formed at the distal end of attached primary conidia to form a catenate series of conidia (Fig. 5, e) several cells in length (at least four). In old cultures, conidia may become brown, thick-walled, and sometimes one-septate (Fig. 5, c). Endoconidia present (Fig. 5, d).

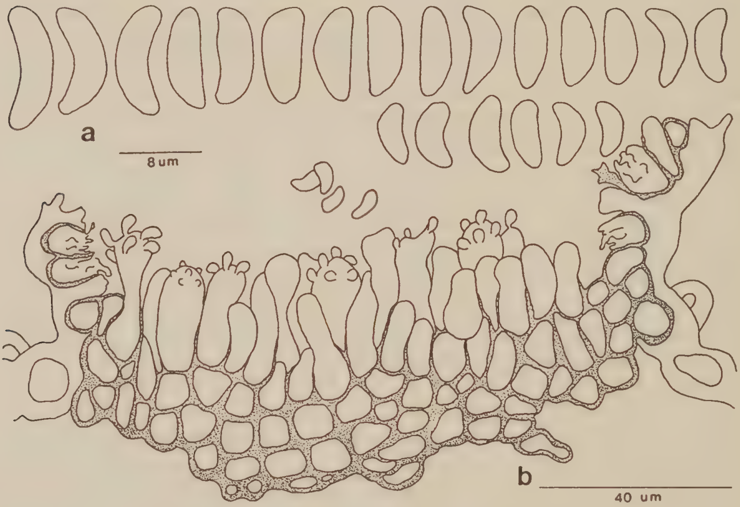

Figure 4. *Selenophoma mahoniae.* a) conidia; b) conidioma with conidiogenous cells.

When the conidiomata are elongate, the irregular rupture of the upper wall is along the greater length of the structure; when conidiomata are circular the rupture may be cruciate. Initially the conidiomata consist of large cells which are dark and rather thick-walled. As maturation progresses, a cavity develops, in the plane of the host surface, which separates the top 2-3 cell layers from those beneath them. The cells lining the cavity produce conidia and disintegrate. Conidium production then progresses, somewhat irregularly, to the next layer of cells outward. Prior to conidiogenesis, the more or less thickened, dark walls of the conidiogenous cells become lighter and thinner, at least at the inner surface, and the cells may increase considerably in size.

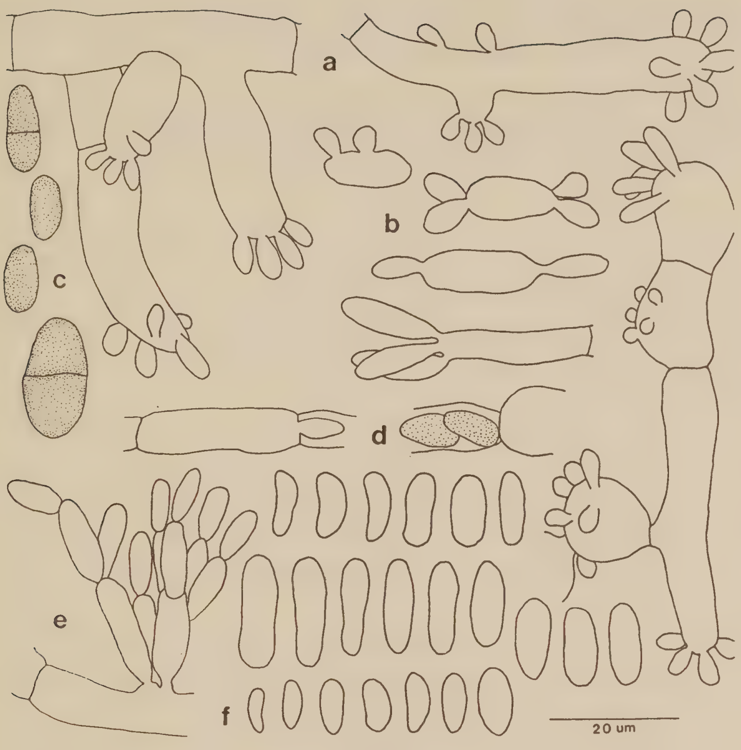

Figure 5. *Aureobasidium* cultural synanamorph state of *Selenophoma mahoniae.* a) conidiogenesis terminal, intercalary or lateral on a protrusion with or without basal septum; b) secondary conidium formation; c) brown, thick-walled conidia; d) endoconidium formation; e) catenate series of conidia; f) conidia.

This species differs from others in the genus (14) in having smaller conidia, more conidiogenous apertures per conidiogenous cell, larger conidiogenous cells, and generally larger condiomata. Although multiple conidium production from the conidiogenous apertures was not seen, this fungus was placed in *Selenophoma* because of the overall similarity of conidiomatal characters, conidium shape, and conidium production from cells with multiple apertures.

Selenophoma mahoniae is easily separated from all the genera in Table 1. except *Kabatiella berberidis.* Both these species have *Aureobasidium* cultural synanamorph forms and polyblastic conidiogenous cells. However, *Kabatiella* has light-colored acervuli or sporodochia with conidiophores and *Selenophoma* has dark-colored, pycnidial conidiomata, which lack conidiophores.

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Literature Cited

1. Arx, J. A. von. 1970. A revision of the fungi classified as *Gloeosporium*. Bibl. Myc. 24: 1-203.
2. Carmichael, J. W. Kendrick, W. B., Conners, I. L., and Sigler, L. 1980. Genera of hyphomycetes. The University of Alberta Press, Edmonton, Alberta, Canada.
3. Fabricatore, J. A. 1948. *Colletotrichum mahoniae* n. sp. parassita su foglie de *Mahonia angustifolium*. Boll. Staz. Pat. veg. Roma, Ser. 3, 6: 133-139.
4. Farr, D. F., Bills, G. F., Chamuris, G. P., and Rossman, A. Y. 1989. Fungi on Plants and Plant Products in the United States. The American Phytopathological Society, 1849 Pilot Knob. Road, St. Paul, Minnesota, 55121.
5. Hermanides-Nijhof, E. J. 1977. *Aureobasidium* and allied genera. Stud. Mycol. 16: 141-177.
6. Lucas, M. T., and Camara, E. 1958. Fungi lusitaniae. Agron. lusit. 17: 132-133.
7. Minter, D. W., Kirk, P. M., and Sutton, B. C. 1982. Holoblastic phialides. Trans. Br. myc. Soc. 79: 75-90.
8. Minter, D. W., Kirk, P. M., and Sutton, B. C. 1982. Holothallic phialides. Trans. Br. myc. Soc. 80:
9. Minter, D. W., Sutton, B. C., and Brady, B. L. 1983. What are phialides anyway? Trans. Br. myc. Soc. 21: 109-120.
10. Morgan-Jones, G., Nag Raj, T. R., and Kendrick, B. 1972. Icones generum coelomycetum, revised. Fascicle IV, pp. 17-19. Department of Biology, Univ. of Waterloo, Waterloo, Ontario, Canada, N2L 3G1.
11. Nag Raj, T. R. and Morgan-Jones, G. 1972. Genera coelomycetum VIII. *Rhabdogloeopsis* Petrak and *Rhabdogloeum* Sydow. Can. J. Bot. 61: 586-593.
12. Nag Raj, T. R. 1982. Genera coelomycetum XXI. *Strasseria* and two new anamorph-genera, *Apostrasseria* and *Nothostrasseria*. Can. J. Bot. 61: 1-30.
13. Spegazzini, C. 1887. Fungi patagonici, n. 177, Buenos Aires; Saccardo, P. A., Syll. fung. III: 468.
14. Sutton, B. C. 1980. The coelomycetes. Commonwealth Mycological Institute, Kew, Surrey, England.
15. Thümen, F., and Winter, H. 1896. Fungi australienses, n. 201, Toulouse; Saccardo, P. A., Syll. fung. III: 629.

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A NEW SPECIES OF MYCOLEPTODISCUS FROM LIVING FOLIAGE OF CHAMAECYPARIS THYOIDES

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Abstract - An undescribed species of *Mycoleptodiscus* was isolated commonly as an endophyte from living leaves of *Chamaecyparis thyoides* in the Pine Barrens of New Jersey. This fungus is described as a new species and is illustrated from culture. This is the first *Mycoleptodiscus* species known to occur on a coniferous host.

Resumen - Una especie de *Mycoleptodiscus*, no descrita, fue aislada frecuentemente de hojas vivas de *Chamaecyparis thyoides* del pinar de New Jersey. Esta especie parece ser una endofita. Este hongo se describe como una nueva especie y por ello presentamos las ilustraciónes de sus cultivos. Esta es la primera especie de *Mycoleptodiscus* encontrada en huésped conifero.

During a study of community structure of endophytic fungi recovered from living twigs and foliage of *Chamaecyparis thyoides* (L.) B.S.P. [Atlantic white cedar] (Bills & Polishook, 1991), we found that the second most frequently recovered organism was an unknown species of *Mycoleptodiscus*. In our survey, we obtained 119 isolates from apparently healthy leaves of 82% (41/50) of the trees we examined at five locations in the coastal plains and Pine Barrens of New Jersey. During a resampling of foliage at one of the sites (1990-91, Success Lake, Ocean Co.) the next winter and summer, we frequently isolated it again indicating that this population is persistent through time. Recent reviews of the genus *Mycoleptodiscus* by Matsushima (1987) and Sutton (1990) facilitated comparison of our strains with the 9 accepted taxa in the genus. Below we propose a new species of *Mycoleptodiscus*, describe its characteristics in culture, and compare it with similar *Mycoleptodiscus* species.

This *Mycoleptodiscus* species can be readily recovered from the internal tissues of healthy leaves of *C. thyoides* by the methods of Petrini (1986). In the following description, cultures were grown on oatmeal agar (OA), cornmeal agar (CM), and malt-yeast extract (YM) agar (all Difco), at 50% relative humidity, 25° C, under continuous fluorescent light for 14 days. Capitalized colors names are from Ridgway (1912). Conidial measurements include the length of terminal appendages. All cultures are deposited in the Merck Microbial Resources Culture Collection unless designated otherwise. A representative isolate has been deposited in the ATCC.

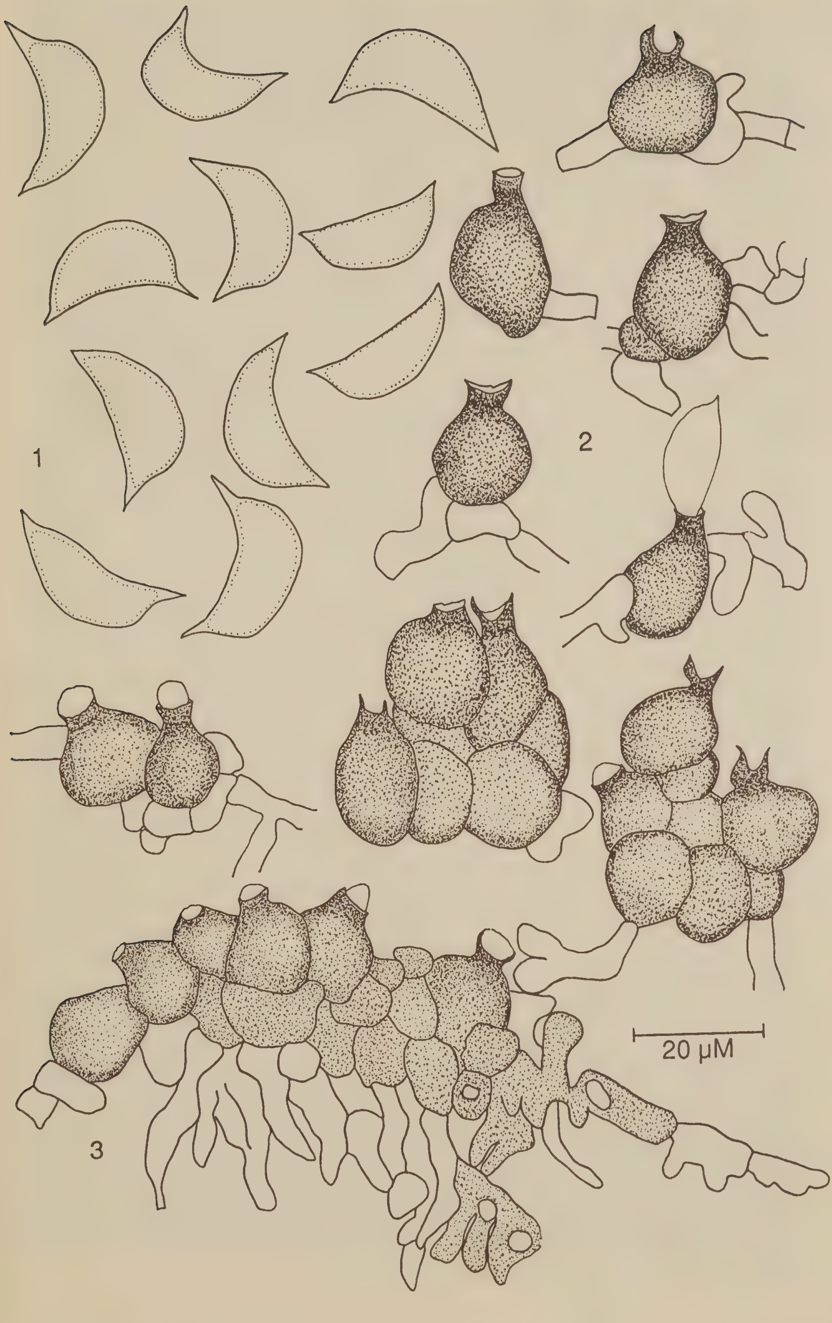
Description of the species

Mycoleptodiscus atromaculans Bills & Polishook, **sp. nov.** (Figs. 1-12)

Mycoleptodicto taiwanensi Matsushima similis sed conidiis majoribus differt. Coloniae in cultura agari hyalinae vel griseae, e conidiomatibus atris maculatae. Conidiomata sporodochialia. Sporodochia primo e grecibus parvis vel catenis cellularum conidiogenarum composita, in culturis maturescentibus massas irregulares confluentes formantia. Cellulae conidiogenae enteroblasticae, globosae vel ellipsoidales, 9.5-14.5 µm diametro, collis 2.5-4 µm longis pallide brunneis vel subatrobrunneis praeditae, collaretto unico 2-7.5 µm lato instructae. Conidia holoblastica, aseptata, cytoplasmate refractivo praedita, late falcata vel lunata, in apice basique angustata appendicibus terminalibus 1-3 µm longis hyalinis formantia, in toto 16.5-25 X 6.5-8.5 µm (appendices includentia). Vulgi in foliis vivis Chamaecyparis thyoidis Novae Caesareae. Holotypus GB1369, Success Lake, Ocean Co., New Jersey (BPI).

Colonies on OA 60-65 mm diam, slightly raised, radially plicate, zonate, with some medium buckling and cracking beneath center of colony, aerial mycelium moderately abundant to sparse at the margin, floccose to minutely hispid, with black sporodochia scattered beneath aerial mycelium over inner third of colony, margin entire, white to pale or medium gray, Pale Drab Gray, Pale Smoke Gray.

Figs. 1-3. *Mycoleptodiscus atromaculans* (GB1369, holotype). Fig. 1. Conidia. Fig 2. Conidiogenous cells. Fig. 3. Young sporodochium with radiating hyphae.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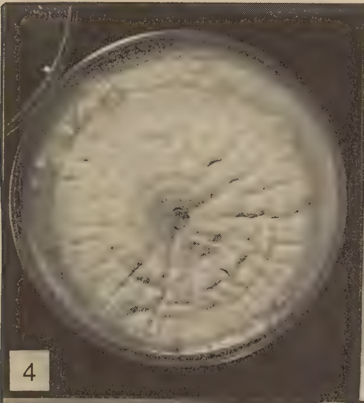
Colonies on YM 50-55 mm diam, slightly raised, radially plicate or not, zonate to concentrically wrinkled, aerial mycelium floccose to minutely hispid, without sporodochia, white to hyaline at the margin, margin even to slightly wavy, reverse zonate, pale grayish yellow, Light Buff, Pale Olive-Buff, gray, Light Olive-Gray, olive-gray, Light Grayish-Olive, to grayish black, Deep Olive-Gray, Iron Gray.

Colonies on CM 55-60 mm diam, plane, zonate, submerged with scant aerial mycelium, margin even to wavy, at first hyaline but soon developing the same colors as above, often with irregular lines or rows of black sporodochial masses radiating outward from inoculation point.

Sporodochia 1-3 cells thick, highly irregular, initially consisting of small groups or chains of conidiogenous cells, in older cultures becoming irregular, confluent masses of >50 conidiogenous cells. *Conidiogenous cells* proliferating enteroblastically, with conidia seceding at the same level, occurring singly, but more often aggregated, arising directly from pigmented superficial mycelium, globose, subglobose, or irregularly ellipsoidal, compressed when aggregated, smooth, 9.5-14.5 µm in diam, with necks 2.5-4 µm long, pale brown to blackish brown in KOH, usually darkest at the base of the neck, with a single cylindrical to widely flaring collarette, with collarettes 2-7.5 µm wide, often with collarettes forming a ragged fringe. *Conidia*, blastic, aseptate, with highly refractive cytoplasm, broadly falcate or lunate, narrowed at apex and base to form terminal appendages, 16.5-25 X 6.5-8.5 µm (including appendages), with appendages 1-3 µm, hyaline. *Hyphae* 1.5-4 µm in diam, septate, branched, hyaline to pale olive gray in KOH.

REPRESENTATIVE SPECIMENS EXAMINED: USA: New Jersey: Burlington Co.: Wading River, near State Highway 563, WSF31LM. Middlesex Co.: Helmetta Pond, HP1LM. Ocean Co.: Success Lake, CM18TB, CM12LM, GB1369 (HOLOTYPE, BPI; ISOTYPE, IMI), GB1370, West Branch of Bass River, near Lake Absegami, BR29LM, Webb's Mill Branch, intersection with State Highway 539, GF42LM.

Figs. 4-12. *Mycoleptodiscus atromaculans* (GB1369, holotype). Fig. 4. Two-week old culture mat on OA (x 0.65), note black sporodochia in center. Fig. 5. Colony emerging from surface-sterilized leaf of *Chamaecyparis thyoides* (x10), note masses of dark conidiogenous cells radiating outward from cut-end of leaf. Fig. 6. Conidia (x 1100). Fig. 7. Conidium (x1700). Figs 9-12. Conidiogenous cells (x1000).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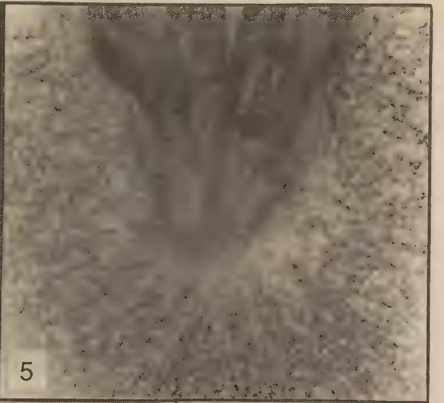
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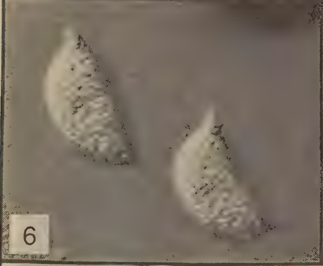
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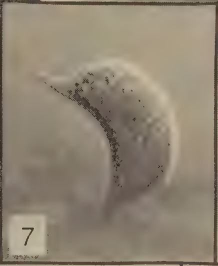
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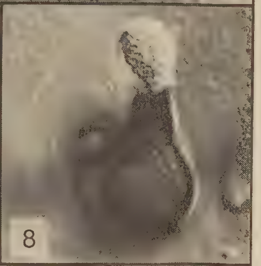
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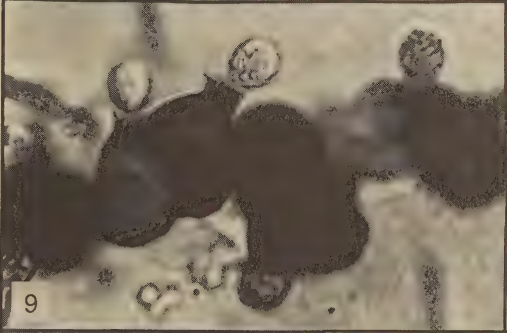
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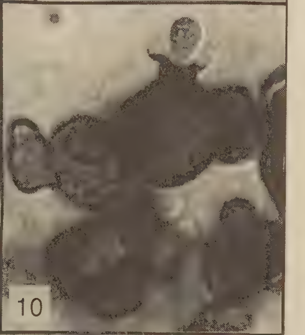
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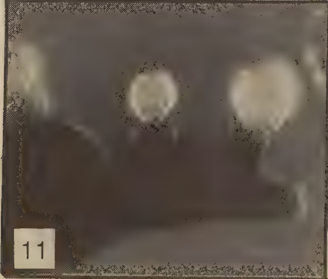
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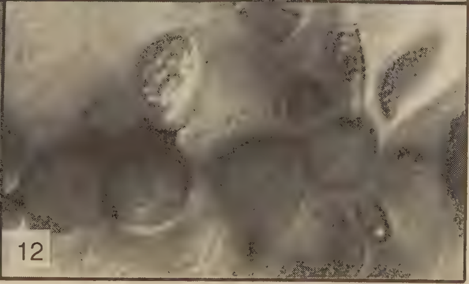
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The large number of isolates of *M. atromaculans* obtained during our survey of endophytes of *C. thyoides* were remarkably uniform in colony and microscopic features. We quickly and consistently learned to recognize and segregrate isolates of this species from among the 842 other fungal isolates recovered from the same set of host plants (Bills & Polishook, 1991). Gross colony features such as radial growth rate, abundance of aerial mycelium, and abundance of condiogenous cells varied in response to nutritional conditions, when our primary isolates, maintained on malt-yeast extract agar, were subsequently transferred to other medium. However, several features of the colonies, such as pigmentation and morphology of conidiogenous cells and conidia remained constant.

Mycoleptodiscus atromaculans is very similar to *M. taiwanensis* Matsushima, a species known only from a decaying leaf rachis of *Areca catechu* L. [betel nut palm] in Taiwan. The shape of the conidia, conidial appendages, and conidiogenous cells are very similar between the two species, however the dimensions of the conidia of *M. atromaculans* were larger. Reference to Matsushima's description and drawing might lead one to indentify the New Jersey strains as *M. taiwanensis*.

To compare the conidial dimensions of the two species, we obtained the dried culture mat of *M. taiwanensis* (Matsushima Fungus Collection 6T720, holotype of *M. taiwanensis*, grown on V8 juice agar) and measured 30 randomly selected conidia in lactophenol. Thirty randomly selected conidia from a dried CM culture mat of *M. atromaculans* were also measured (we were unable to induce sporulation of this isolate on V8 juice agar). Almost no overlap in conidial dimensions occurred between the two spore samples (Fig. 13). The comprehensive key of Sutton (1990), which in turn was based on Matsushima's description, is somewhat deceptive indicating that the range of conidial lengths of *M. taiwanensis* range from 12-21 µm. Conidia greater than 16 µm long were rare in Matsushima's specimen with the mean size of 14.5 ± 1.6 X 5.3 ± 0.4 µm (n=30). Conidia less than 17 µm are rare in cultures of *M. atromaculans*, with the mean dimensions of 20.3 ± 1.9 X 7.5 ± 0.4 µm. Thus *M. atromaculans* differs from *M. taiwanensis* by its larger conidial dimensions, host affinity and geographic distribution.

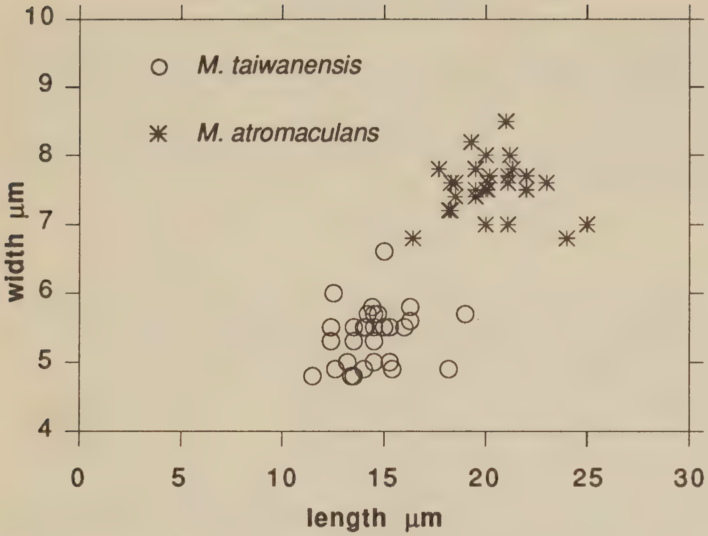

Fig. 13. Scatter plot comparing conidial dimensions of *M. atromaculans* (GB1369, holotype) and *M. taiwanensis* (MFC 6T720, holotype). Thirty randomly selected conidia from dried culture mats of each culture were measured in lactophenol preparations. Note some measurements are hidden from view.

We concur with Sutton's observations (1973; 1990) that species of *Mycoleptodiscus* soon lose the capacity to sporulate when repeatedly transferred and stored in agar culture. Colonies of *M. atromaculans* exhibited heaviest sporulation as they emerged from surface-sterilized leaves (Fig. 5), with the amount of sporulation declining with each successive transfer. Conidia and conidiomata were most easily observed on dilute media such as cornmeal agar. We were able to store 6 strains for at least 8 months, by cutting 5 mm agar discs from the edges of actively growing colonies on YM, and storing 4-5 discs in 5 ml of sterile distilled water in 12 ml vials at 5^{o} C. When agar discs were transferred from water back on to YM, all discs grew readily. Little deterioration in colony vigor was observed with this storage method when compared to the same isolates stored on agar slants.

Acknowledgments

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References

Bills, G.F. and J.D. Polishook. 1991. Recovery of endophytic fungi from *Chamaecyparis thyoides*. (unpublished manuscript).
Matsushima, T. 1987. Mycological Memoirs 5. Kobe, Japan. Published by the author.
Petrini, O. 1986. Taxonomy of endophytic fungi of aerial plant tissues. pp. 175-187. In: Microbiology of the Phyllosphere. (Fokkema, N. J.,van den Heuvel, J., eds.) Cambridge University Press, Cambridge.
Ridgway, R. 1912. Color Standards and Nomenclature, Published by the author, Washington, D.C.
Sutton, B.C. 1973. *Puccinopsis*, *Mycoleptodiscus*, and *Amerodiscosiella*. Transactions of the British Mycological. Society. 60: 525-536.
Sutton, B.C. 1990. New species of *Mycoleptodiscus* (Hyphomycetes). Mycological Research 94: 564-566.

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PEELE'S LEPIOTA: AN IDENTIFICATION AND A CLARIFICATION

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SUMMARY

Based on all the available evidence, the mushroom known as Peele's Lepiota is identifiable as Lepiota humei Murrill. Despite claims of psychoactive properties, bioassay results have been negative.

For nearly a decade, a general sense of puzzlement has prevailed concerning reports of a purportedly hallucinogenic mushroom known as Peele's Lepiota. These reports were widely disseminated to the lay public not in scientific journals, but in the pages of commercial magazines devoted to the youth counterculture and what might be termed "recreational pharmacology." Riding the crest of a wave of popular interest in the so-called magic mushrooms, accounts of this proclaimed new species of Lepiota with psychoactive properties have generally provoked skepticism among mycologists, and also occasional curiosity as to the actual identity of the particular mushroom involved. In an effort to sort fact from fiction, this paper will propose an identification of Peele's Lepiota, and a clarification regarding its reputation for hallucinogenic effects.

The strange saga of Peele's Lepiota apparently began in 1982. In that year, Stephen Peele, an independent and sometimes criticized Pensacola-based mycological entrepreneur, produced a serialized manuscript titled "Lepiota Peele, a newly discovered hallucinogenic mushroom" (Peele, 1982). In this report, Peele relates that he encountered several individuals in local cattle pastures collecting a certain species of mushroom which grew there. They indicated to him that it was hallucinogenic and that they preferred it for recreational usage to Psilocybe cubensis (Earle) Singer, the well known psilocybin mushroom of the Gulf Coast pasturelands. His curiosity piqued, Peele ingested three specimens. He reported that a hallucinatory visual display of undulating black lines ensued, and accordingly considered the claim of psychoactive properties to be adequately verified.

Peele identified the mushroom involved to genus Lepiota. The pileus, which measured about four to eight centimeters in diameter, was squamulose and white, with a yellowish umbo that turned brownish with age. The pileus also bore an overall resemblance to that of Chlorophyllum molybdites (Meyer) Massee, except that it was smaller, slightly less scaly, and had white lamellae at maturity rather than green. The annulus was of the same type as C. molybdites (and many Lepiota species)--persistent, membranous, double-edged, and tending to become detached in age so that it can easily slide down the stipe. When bruised, Peele's Lepiota exhibited a distinctive "beet red" bruising reaction, especially vivid in younger specimens, displaying as a more "brown maroon" shade in older material. Peele hedged to state that, although this Lepiota was not rare in its habitat, it "may be" a new species, since he was unable to identify it as any known species of Lepiota, of which by his account "there are about thirty" (Peele, 1982). It should be noted here that a more accurate estimate of North American species of Lepiota would probably number around two-hundred (Arora, 1986).

The potential significance of a psychoactive Lepiota, if it were verifiable, should not be dismissed out of hand. Peele (1982) reported that psilocybin was not present in his mushroom, which might suggest the intriguing possibility of active compounds not previously found in fungi, perhaps even entirely novel. If substantiated, Peele's Lepiota might thus represent an entirely new and unique type of hallucinogenic mushroom. Chemically, only two different groups of hallucinogenic agarics have been distinguished to date. The first is exemplified by Amanita muscaria (Sing.) Jenk. and A. pantherina (Fr.) Krombhz., which contain the indole alkaloids muscimol, muscazone, and ibotenic acid as their principle active constituents (Lincoff and Mitchel, 1977). The other group is more diverse taxonomically and is represented by those species of *Psilocybe*, *Panaeolus*, *Copelandia*, *Conocybe*, *Gymnopilus*, and *Pluteus* which contain psilocybin, psilocin, and related alkaloids, also indole derived (Lincoff and Mitchel, 1977; Saupe, 1981). Considering that representatives of both chemical groups have been the objects of long standing rituals in a number of indigenous societies, one might anticipate that, if verified, some such usage of an hallucinogenic *Lepiota* might perhaps be observable in some remote traditional culture somewhere. Peele's *Lepiota* thus posed something of a challenge to both fungal toxicology and ethnomycology, one which begged inquiry.

The prospects for research, however, have generally seemed problematic. No proper description of Peele's *Lepiota* has ever appeared in any journal, so the validity of the species, as well as that of proposed binomials for it, "*Lepiota peele*" and "*Lepiota bigwoodii*," has never been established. Neither has it been available for examination and identification, given the lack of a type, cotype, or other voucher specimens. A pending report on the chemistry of Peele's *Lepiota*, announced in 1983, has never been published (Anonymous, 1983). Peele has also declined to supply specimens for inspection (personal communication).

The only material available for study has been the description, a few photographs which have been published in magazines, and spore prints purchasable from Peele's company, FMRC (Florida Mycology Research Center, Pensacola, Florida). Given this paucity of evidence, it seems somewhat astonishing that Peele's *Lepiota* has not only inspired its share of curiosity, but has even debuted in at least one published key to the genus (Arora, 1986). In an effort to shed some light on this whole matter, the available evidence has now been examined along with material in the University of Florida Herbarium, with interesting and conclusive results.

A crucial link in the identification of Peele's *Lepiota* was supplied by a photograph taken by Jeremy Bigwood, published in 1983 (Anonymous, 1983). It clearly portrays one significant feature of this Lepiota missing from Peele's own description: a sulcinately striate margin, which typifies those species now assigned to the newer generic designation Leucocoprinus. When this character was added to Peele's description, a very close resemblance, indeed an apparent probable identity with L. humei Murrill was noted.

Lepiota humei, also known as Hume's Lepiota, was first collected from the Gainesville area in 1938; its description was not published until five years later (Murrill, 1943). It has been reported growing in open areas, lawns, gardens, oak-pine woods, and most significantly, on manure piles (Fig. 4). Its mid-size stature matches that of Peele's Lepiota, as does the coloration of its squamulose pileus, "white with a pale dingy brownish yellow umbo," as well as the distinctive type of annulus it bears (Weber and Smith, 1985). Finally, and most suggestively, bruised areas on both the pileus and stipe turn "maroon then dark brown" without any preliminary yellow to orange stage, in contrast to quite a few other red-bruising Lepiotas (ibid.). This set of characters succinctly recapitulates the basic description of Peele's Lepiota (Figs. 5-6).

Spores of L humei have been described as 7.5-9(10.5) x 5-6(7) µm, dextrinoid, and without an apical pore (Weber and Smith, 1985). Peele described the spores of his Lepiota as slightly elliptical, thin-walled, and possessing an apical pore. The range of spore shape and size varies widely in genus Lepiota and is of great diagnostic importance (see Table 1.). Accordingly, spores

Table 1. Comparison of spore shape and size in Lepiota

Species	Spore dimensions	Spore shape
L. seminuda	3-5 x 2-3 µm	elliptical
L. eriophora	3-6 x 2-3 µm	oblong
L. cristata	5-8 x 3-5 µm	bicornate
L. flammeatincta	6-8.5 x 4-5 µm	elliptical
L. humei	7.5-9(10) x 5-7 µm	elliptical
L. lutea	8-13 x 5.5-8 µm	elliptical
L. clypeolaria	12-20 x 4-6 µm	fusiform
L. procera	12-18 x 8-12 µm	broadly elliptical

from Peele's *Lepiota*, purchased from FMRC in 1983, were carefully examined and compared with spores from the cotype of *Lepiota humei* (FLAS F 18044) against the descriptions given above. Contrary to Peele's notation, no apical pore was observable in the spores of Peele's *Lepiota*, consistent with the hypothesized identification as *L. humei*. Compared side by side, spores of Peele's *Lepiota* and Hume's *Lepiota* were both dextrinoid, apiculate, and had the same basic shape, size, and spore wall thickness--indistinguishable in every respect, and apparently identical (see Figs. 1-2). Clearly, then, Peele's *Lepiota* can and should be considered as *L. humei*.

Having thus resolved the taxonomic issue, attention turned next to the claims of psychoactive effects. No information was available on the toxicity or edibility of *L. humei*, so a bioassay was deemed the appropriate and necessary next step. Since this would require fresh specimens in sufficient quantity, a field surveillance for this species was undertaken. Murrill (1943) described Hume's *Lepiota* from the greater Gainesville area, and several sources cited it from manured pastures, some of the same ones which bear *P. cubensis* according to Peele (1982). Consequently, pastures around Gainesville with a reputation for "magic mushrooms" were checked, and collections of *L. humei* were soon obtained (voucher material deposited, FLAS F 55643). The identification was based upon concordance of field characters with microscopic features. The spores of fresh specimens, unlike the older material, prominently displayed a single reserve globule, in agreement with Murrill's (1943) observation of a uniguttulate condition (Fig. 3).

Because some *Lepiota* species, e.g. *L. clypeolaria* (Bull. ex. Fr.), *L. castanea* (Quel.), and *L. helveola* (Bres.), contain amatoxins, the Meixner test utilizing hydrochloric acid and a piece of newspaper bearing the expressed, dried juice of the carpophores was repeatedly performed (Meixner, 1979; Beutler and Vergeer, 1980). This served to establish with reasonable confidence the absence of these lethal toxins in this species, and thus ensure the relative safety of the bioassay procedure.

Peele (1982) reported his hallucinatory display after consuming three average sized specimens, but he also noted little in the way of any noticeable sensation of intoxication. Indeed, much of the claim for this species' psychoactive properties seems to have been based on Peele's reported observation of several mushroom hunters collecting this species, ostensibly for usage as a recreational inebriant, even in preference to P. cubensis. One of these individuals was quoted as equating a dosage of five to six specimens with "a standard LSD trip" (Anonymous, 1983).

Subsequently, over a period of weeks, gradually increased amounts of fresh L. humei were ingested on an empty stomach. Dosages of even five to six robust specimens produced no perceptible sensory effects or alterations of either a toxic or hallucinogenic nature. The flavor was mild, even minimal, which incidentally matches Peele's own comment about his mushroom having "almost no taste, only slightly earthy" (Peele, 1982). It seems clearly indicated that reports of altered perceptual states brought about by ingestion of this species--perhaps like the preliminary reports of Samuel Clemens' untimely demise--have been greatly exaggerated. It is interesting from an ethnomycological perspective that inquiries within segments of the local society given to experimentation with P. cubensis have revealed no comparable interest in or utilization of L. humei. Although these psychomycophiles may not be very cognizant of technical mycological literature, the magazines which reported on "Florida's new super 'shrooms" are well known to them. Given this, it would seem quite remarkable, if indeed L. humei had any psychoactive potential, that no such usage should have arisen in the decade since this story was released.

It is not easy to gauge the spirit in which reports of Peele's Lepiota were promulgated. Whether this was a case of misidentification, imagination and power of suggestion, or even a hoax cleverly geared to exploit the naive gullibility of an

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Figs. 1-6. 1. Spores of L. humei cotype (FLAS F 18044), 1000 x. 2. Spores of Peele's Lepiota, 1000 x. 3. Spores of L. humei, fresh collection (FLAS F 55643), 1000 x. 4. Habitat, L. humei. 5. L. humei, fresh collection showing developmental stages. 6. L. humei, cotype (left) and fresh collection (right).

unwitting lay public, the evidence presented here seems sufficient to resolve the more accessible issues of greater scientific concern. But even apart from the taxonomic identification proposed here, the suggested binomials for Peele's mushroom, since they were not published according to the international rules of botanical nomenclature, would still be invalid, as would the concept of the species itself. If there is any moral here, it may be that mycologists are better equipped than the general public to evaluate mycological matters, and sensational announcements of scientific "discoveries" in nonscientific literature should be viewed with reservation.

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LITERATURE CITED

Anonymous. 1983. New psychoactive 'shroom discovered. High Times 99: 19, 25-27.

Arora, D. 1986. Mushrooms Demystified. Second Ed. Ten Speed Press, Berkeley. 959 p.

Beutler, J.A., and P.P. Vergeer. 1980. Amatoxins in American mushrooms: evaluation of the Meixner test. Mycologia 72: 1142-1149.

Lincoff, G., and D.H. Mitchel. 1977. Toxic and Hallucinogenic Mushroom Poisoning. Van Nostrand Reinhold, New York. 267 p.

Meixner, A. 1979. Amatoxin-nachweis in pilzen. Z. Mykol. 45: 137-139.

Murrill, W.A. 1943. More new fungi from Florida. Lloydia 6: 207-228.

Peele, S. 1982. Lepiota Peele, a newly discovered hallucinogenic mushroom. FMRC, Pensacola. 5 p.

Saupe, S.G. 1981. Occurrence of psilocybin/psilocin in Pluteus salicinus (Pluteaceae). Mycologia 73: 781-784.

Weber, N.S., and A. Smith. 1985. A Field Guide to Southern Mushrooms. University of Michigan Press, Ann Arbor. 280 p.

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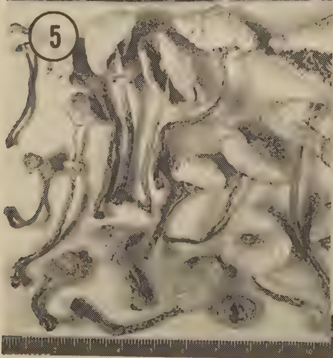
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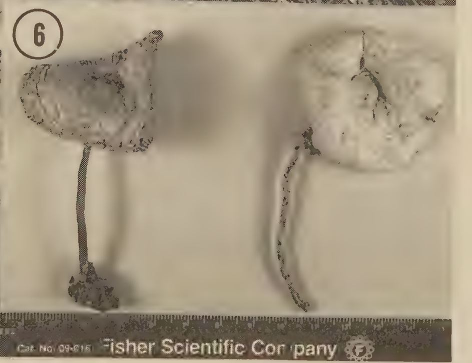
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THE NOMENCLATURE OF *PLASMOPARA* PARASITIC ON UMBELLIFERAE

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Abstract. The nomenclatural status and taxonomic position of the three binomials used for the aggregate species of *Plasmopara* attacking Umbelliferae is revised. *Plasmopara crustosa* (Fr. : Fr.) Jørstad *and Plasmopara nivea* (Unger) Schröter are considered doubtful. Their taxonomic position cannot be clarified because of poor descriptions, and/or lack of illustration, and the absence of original specimens. *Plasmopara umbelliferarum* (Caspary) Schröter ex Wartenw. is lectotypified and reinstated. ***Keywords***: *Plasmopara crustosa, Plasmopara nivea, Plasmopara umbelliferarum*, Umbelliferae, nomenclature.

One of the commonest diseases of Umbelliferae, the downy mildew, is produced by fungi belonging to the genus *Plasmopara* (Oomycota). During the preparation of a monographic study of *Plasmopara* (Constantinescu, unpubl.), about 53 species from 37 genera of Umbelliferae were found to be attacked, but the actual number of hosts is probably much higher.

Traditionally, as a result of a broad species concept, it was considered that a single 'collective' or 'aggregate' species is involved, and three binomials, *Plasmopara crustosa* (Fr. : Fr.) Jørstad, *Plasmopara nivea* (Unger) Schröter, *and P. umbelliferarum* (Caspary) Schröter ex Wartenw. have chronologically been used for this fungus. During the last ca. 65 years a narrower species concept prevailed, and ca. 28 'micro-species', each presumably confined to one host genus, were described. In numerous floristic studies or regional floras (Buhr 1956, Ciferri & Camera 1963, Doppelbaur et al. 1965, Osipian 1968, Gaponenko 1972, Vasyagina et al. 1977, Dimitrova 1984, Stanevičiene 1984, Bánhegyi et al. 1985), the names of both micro- and aggregate species were used. In these publications, the name of the aggregate species is reserved for the fungi attacking plants belonging to genera not covered by the micro-species. As a consequence, the circumscription (i.e. the host range) of the aggregate species varies. Although this is primarily a taxonomic problem, much of the confusion regarding *Plasmopara* on Umbelliferae has its origin in the nomenclature of these three species.

The aim of this note is to clarify the nomenclatural status and taxonomic position of these binomials, as a prerequisite for the taxonomic revision of *Plasmopara* on Umbelliferae. Preliminary results (Constantinescu, unpubl.), show that more than one species of *Plasmopara* can be recognised on Umbelliferae.

Plasmopara crustosa (Fr. : Fr.) Jørstad, Skr. norske Vidensk-Akad., Mat.-naturv. Kl. 10: 12. 1963 ≡ *Botrytis crustosa* Fr. : Fr., Syst. mycol. 3: 403. 1832 ≡ *Verticillium crustosum* (Fr. : Fr.) Rabenh., Deutschl. KryptFl. 1: 100. 1844 ≡ *Peronospora crustosa* (Fr. : Fr.) Fr., Summa Veg. Scand. p. 493. 1849 (as '*Perenospora*'). Type indicated on dead stem and leaves of *Heracleum sphondylium* L., Sweden, (most probably Småland, Femsjö), autumn, pre 1832.

Fries apparently examined only the material seen by him in nature ('v.v.'). No illustration was provided and no voucher specimen exists in Fries' herbarium at UPS.

The morphological characters of *Botrytis crustosa* are not indicative of a member of the Peronosporaceae. The 'mucilaginous-mealy' appearance of the colonies, and the verticillate branching of the sporulating structures, suggest the presence of a Hyphomycetous rather than a Peronosporaceous fungus. Because of the verticillate type of branching, Fries placed *B. crustosa* in the tribe *Verticillatae* together with *B. tenera* (Nees) Fr. (≡ *Verticillium tenerum* (Nees : Fr.) Link, now correctly to be named as *V. luteoalbum* (Link : Fr.) Subram.), the type species of the genus *Verticillium*, and three similar fungi. All these fungi were described as saprophytic, on decaying or dead stems. Rabenhorst (op. cit.) combined *B. crustosa* into *Verticillium* with no further comments.

Fries (1832) cited *Mucor dematium* Fr., from leaves of *Hedera*, as a synomym of *B. crustosa*. *Hedera* is not known as host of any Peronosporaceae. *Mucor dematium* was later considered a synonym of *Rhizopus nigricans* Ehrenb., now known as *R. stolonifer* (Ehrenb. : Fr.) Vuill., a member of Zygomycota.

The probability that *B. crustosa* is based on a Hyphomycete is further supported by an ecological study of microfungi on decaying stems of *Heracleum sphondylium* (Yadav 1966). During that study, one of the most commonly encountered fungi was an *Acremonium* (= *Cephalosporium*). *Acremonium* is close to *Verticillium* (Gams 1971) and it is very probable that what Fries had actually examined was either a *Verticillium* or an *Acremonium* and his '*sporis globosis terminalibus*' refers to masses of conidia rather than individual spores.

If Fries really had had a Peronosporaceous fungus at hand, it only could have been the common *Plasmopara* of Umbelliferae. However, the presence of sporangiophores and sporangia of *Plasmopara* on dead stems and leaves is very unlikely. *Plasmopara* is normally restricted to leaves.

Moreover, when the host is dead, sporangiophores and sporangia are no longer present on the surface of the attacked organs. In addition, the host plant indicated by Fries, *Heracleum sphondylium*, is a very rare host of this fungus. On these grounds, Skalický (1966: 125) challenged the decision of Jørstad (1963) to reinstate Fries' binomial. Skalický also considered that *Botrytis crustosa* was probably based on a Hyphomycete.

During the examination of herbarium material for a monograph of *Plasmopara*, of ca. 700 specimens on various Umbelliferae I found only three parasitic on *Heracleum sphondylium*. None of these was from Sweden. My attempts to select a neotype from among specimens present in herbaria, or to collect new material fulfilling the condition for a neotype (i.e. specimen of *Heracleum sphondylium* collected during autumn, from Sweden, possibly around Femsjö, and showing the fungus on leaves and stems) were unsuccessful.

It seems that the decision by Fries (1849) to transfer his *Botrytis crustosa* to *Peronospora* was not a result of his better acquaintance of this fungus, but of an information provided by Berkeley (1836: 343), referred to as 'B.7' in Fries (1849: 493). There is little doubt that Berkeley had something else at hand but a specimen of *Plasmopara*. This is clear from the indication of the host, *Aegopodium podagraria*, a plant on which this fungus occurs frequently. Berkeley's reason to assign the fungus found by him to *Botrytis crustosa* was the host, and not Fries' description. His statement is significant in this respect: 'I rely more upon the evident affinities of the plant than on the technical character given above by Fries'. In 1843 Berkeley distributed specimens labelled *Botrytis crustosa* Fr. under no. 333 of his exsiccata, British Fungi. The fungus preserved under this number in herb. UPS is, however, *Plasmopara densa* (Rabenh.) Schröter on *Rhinanthus* sp., and the same holds true for the copy in herb. K (Francis & Waterhouse, 1988: 49). It is obvious that Berkeley modified the circumscription of *Botrytis crustosa* by linking it to what is now known as *Plasmopara*. Fries, who was not very familiar with these fungi, accepted Berkeley's opinion, and substitution. Later, Berkeley (1860: 349) cited *B. crustosa* as a synonym of *Peronospora macrospora* (Unger) Unger (as 'Caspary'), on Umbelliferae, again connecting the binomial introduced by Fries with *Plasmopara*.

According to Nannfeldt (1979), Fries considered that 'the Hyphomycetes and epiphyllous fungi were so innumerable that they did not deserve separate names' and, consequently, 'he soon left them for good'. All facts point out that what Fries had described under *Botrytis crustosa* was a Hyphomycete. There are no reasons to further consider Fries' fungus a *Plasmopara* and to encourage the use of the name introduced by him.

Besides Jørstad (1963, 1964), the name *Plasmopara crustosa* was used by few authors (Pyldmaa 1967, Boerema & Verhoeven 1976, Järva & Parmasto 1980, Ulvinen & al. 1981, Francis & Waterhouse 1988, Farr & al. 1989). However, as all these are reference publications, there is a risk that this name will be more widely used.

Plasmopara nivea (Unger) Schröter in Cohn, Krypt.-Fl. Schles. 3(1) Pilze 1: 237. 1886 ≡ *Botrytis nivea* Unger [as 'Mart.'], Exantheme der Pflanzen: 171. 1833 ≡ *Peronospora nivea* (Unger) Unger [as 'Unger'], Bot. Ztg. 5: 314. 1847. Original specimens on *Aegopodium podagraria* L., *Chenopodium bonus-henricus* L., *Geranium sylvaticum* L., *Euphrasia officinalis* L., *Senecio vulgaris* L., *Chrysosplenium alternifolium* L., *Isopyrum thalictroides* L. and *Ranunculus repens* L., collected from Tyrol, Austria. No herbarium specimen is extant.

The description and illustration provided by Unger (1833) under *Botrytis nivea* can be referred to any Peronosporaceous fungus. Because these fungi have a rather narrow host preference, the precise indication of the host may sometimes compensate a poor or incomplete description. Unfortunately, by listing eight host plants belonging to seven families, Unger caused much confusion. Moreover, later (Unger 1836, 1847) he added *Cirsium arvense* (L.) Scop., *Cardamine enneaphyllos* (L.) Crantz. (≡ *Dentaria enneaphyllos* L.) and *Lactuca sativa* L. to the list of hosts. As a consequence, the circumscription of *Botrytis nivea* became vague. If the fungi he found and described under *B. nivea* were indeed Peronosporaceae – which in all probability was the case – then at least three genera (*Bremia*, *Peronospora* and *Plasmopara*) and a larger number of species were involved.

Caspary (1855: 328) was the first to comment upon the confusion created by the introduction of this name. Nevertheless, the epithet has extensively been used, under *Plasmopara nivea*, not only in the old literature, but also in more recent papers, lists or local floras (Hara 1954, Lindtner 1957, Jermalavičiute 1962, Ciferri & Camera 1963, Greene 1965, Doppelbaur et al. 1965, Conners 1967, Osipian 1968, Gaponenko 1972, Doppelbaur & Doppelbaur 1972, Lucas & Dias 1976, Vasyagina & al. 1977, Tai 1979, Stanevičiene 1984, Kirgizbaeva & al. 1985, Bánhegyi & al., 1985, Kenneth 1989).

Although taxa based on discordant elements may be accepted under the current Code of Botanical Nomenclature after lecto- or neotypification (Greuter et al. 1988), the description, illustration, and list of hosts/specimens provided by Unger are in no way conclusive for the selection of one element as lectotype. Moreover, the absence of the original specimens makes any choice impossible. Consequently, the use of the binomial *Plasmopara nivea* should be avoided.

Plasmopara umbelliferarum (Caspary) Schröter ex Wartenw. – Annls mycol. 16: 252. 1919 ≡ *Peronospora umbelliferarum* Caspary – Monatsb. K. Akad. Wiss. Berlin 3: 328. 1855 ≡ *Peronospora umbelliferarum* Caspary var. *aegopodii* Caspary – Monatsb. K. Akad. Wiss. Berlin 3: 328. 1855 ≡ *Plasmopara aegopodii* Trotter [as '(Caspary) Trotter', nom. illegit., Art. 63.1] *in* Sacc. – Syll. Fung. 24: 65. 1926. Lectotype (here selected) on *Aegopodium podagraria* L., Germany, forest near Berlin, 5 July 1854, R. Caspary (ZT!).

Caspary (1855) provided a precise description and an excellent illustration of this fungus, under *Peronospora umbelliferarum*. Concomitantly, he described four varieties: var. *conii*, var. *angelicae*, var. *chaerophylli*, and var. *aegopodii*, parasitic on *Conium*, *Angelica*, *Anthriscus* (*Chaerophyllum*) and *Aegopodium*, respectively. Besides the indication of some differential characters, he also cited data about the original collection for each variety but not for the species and, consequently, no autonym was created. As a result, *Peronospora umbelliferarum* is based on four (probably discordant) elements, i.e. the types of the four varieties (each specimen being a syntype). All the varieties were later combined into *Plasmopara* and raised to species rank by Trotter (1926).

In order to provide a correct nomenclatural status of this species, the type of one of the varieties described by Caspary, namely of *Peronospora umbelliferarum* Caspary var. *aegopodii* Caspary, is here selected as the lectotype of *Peronospora umbelliferarum* var. *umbelliferarum*. This decision is based on the following reasons: the specimen is one of those examined by the original author, the characters of the fungus agree with the original description, and *Aegopodium podagraria* is the commonest of the hosts listed for the four varieties.

Except for a few papers, lists or local floras (Holm, 1946, Kochman & Majewski, 1970, Constantinescu & Negrean, 1983, Dimitrova, 1984), the name *Plasmopara umbelliferarum* did not come into general usage for the downy mildew of Umbelliferae.

Conclusion. Both *Plasmopara crustosa* and *Plasmopara nivea* are very doubtful names and should not be used. The taxonomic status of the fungi involved cannot be clarified because of poor descriptions, and/or lack of illustrations, and the absence of original specimens. The first of these binomials has a protected status under Art. 13.1(d) of the ICBN, but it is most probably based on a hyphomycetous fungus. By contrast, *Plasmopara umbelliferarum* is a well-described and illustrated fungus supported by relevant herbarium specimens. By the lectotypification proposed its nomenclatural status is corrected.

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Literature cited

Bánhegyi, J., Tóth, S., Ubryzsy, G. & Vörös, J. 1985. Magyarország mikroszkopikus gombáinak határozókönyve. Akadémiai Kiadó, Budapest.

Berkeley, M.J. 1836. British Fungi. In Smith, J.E. (ed.), English Flora. 5(2): 1–386 + I–XV.

Berkeley, M.J. 1860. Outlines of British Fungology. L. Reeve, London.

Boerema, G.H. & Verhoeven, A.A. 1976. Check-list for scientific names of common parasitic fungi. Series 2a: Fungi on field crops: beet and potato; caraway, flax and oilseed poppy. *Neth. J. Pl. Path*. 82: 193–214.

Buhr, H. 1956. Zur Kenntnis der Peronosporaceen Mecklenburgs. *Arch Fr Naturgesch. Mecklenburg* 2: 109–243.

Caspary, R. 1855. Über zwei- und dreierlei Früchte einiger Schimmelpilze (Hyphomyceten). *Monatsb. K. Akad. Wiss. Berlin* 3: 308–333.

Ciferri, R. & Camera, C. 1963. Tentativo di elencazione dei funghi italiani. III. Peronosporales. *Quad. Lab. crittogam., Pavia* 30: 1–39.

Conners, I.L. 1967. An Annotated Index of Plant Diseases in Canada. Canada Dept. of Agric., Ottawa.

Constantinescu, O. & Negrean, G. 1983. Check-list of Romanian Peronosporales. *Mycotaxon* 16: 537–556.

Cooke, M.C. 1871. Handbook of British Fungi. London and New York.

Dimitrova, E.G. 1984. Contribution to the flora of Peronosporaceous fungi of Bulgaria.II. *Fitologiya, Sofia* 27: 69–71.

Doppelbaur, H. & Doppelbaur, Hanna. 1972. Nachträge zur Peronosporaceenflora Bayerns. *Ber. bayer. bot. Ges*. 43: 145–148.

Doppelbaur, H., Huber, J. & Poelt, J. 1965. Die Peronosporaceen Bayerns. Eine erste Übersicht. *Ber. bayer. bot. Ges.* 38: 69–88.

Farr, D.F., Bills, G.F., Chamuris, G.P. & Rossman, A.Y. 1989. Fungi on Plants and Plant Products in the United States. APS Press, St.Paul.

Francis, S.M. & Waterhouse, G.M. 1988. List of Peronosporaceae reported from the British Isles. *Trans. Br. mycol. Soc*. 91: 1–62.

Fries, E.M. 1832. Systema mycologicum. Vol. 3. Lund and Greifswald.

Fries, E.M. 1849. Summa Vegetabilium Scandinaviae. A. Bonnier, Stockholm & Leipzig.

Gams, W. 1971. Cephalosporium-artige Schimmelpilze (Hyphomycetes). Gustav Fischer, Stuttgart.

Gaponenko, N.I. 1972. Semeistvo Peronosporaceae Srednei Azii i Yuzhnogo Kazakhstana. Fan, Tashkent.

Greene, H.C. 1965. The Fungi Parasitic on Plants in Wisconsin. Univ. Wisconsin, Madison.

Greuter, W., Burdet, H.M., Chaloner, W.G., Demoulin, V., Grolle, R., Hawksworth, D.L., Nicolson, D.H., Silva, P.C., Stafleu, F.A., Voss, E.G., McNeill, J. 1988. International Code of Botanical Nomenclature. *Regnum veg*. 118: 1–328.

Hara, K. 1954. A list of Japanese fungi hitherto known. 4th. ed.

Holm, L. 1946. On the variation of the conidia in *Plasmopara umbelliferarum* (Casp.) Schroet. in relation to different hosts. *Svensk bot. Tidskr*. 40: 55–62.

Järva, L. & Parmasto, E. 1980. Eesti Seente Koondnimestik (List of Estonian Fungi). Est. Acad. Sci., Inst. Zool. & Bot., Tartu.

Jermalavičiute, S. 1962., Griby poryadka Peronosporales Litovskoi SSR. In Botanicheskie Issledovaniya. II. Raboty po miko- i likhenoflore

Pribaltiki: 101–107. Inst. Zool. & Bot., Acad. Nauk Estonskoi SSR, Tartu.

Jørstad, I. 1963. Icelandic parasitic fungi apart from Uredinales. *Skr. Norske Vidensk.-Akad. Oslo I Mat. -Naturv. Kl. NS* 10: 1–72.

Jørstad, I. 1964. The phycomycetous genera *Albugo*, *Bremia*, *Plasmopara* and *Pseudoperonospora* in Norway, with an appendix containing unpublished finds of *Peronospora*. *Nytt Mag. Bot.* 11: 47–82.

Kenneth, R.G. 1989. Up-dated regional host-downy mildew checklists: a necessity. *Phytoparasitica* 17: 131–132.

Kirgizbaeva, Kh.M., Sagdullaeva, M.Sh., Ramazanova, S.S. & Gaponenko, N.I. 1985. Flora gribov Uzbekistana. Vol. 2. Fan, Tashkent.

Kochman, J. & Majewski, T. 1970. Grzyby (Mycota). Vol. IV. Phycomycetes, Peronosporales. Warszawa.

Lindtner, V. 1957. An account of the cryptogamic flora of Yugoslavia. *Bull. Mus. Hist. Nat. Pays Serbe*, Ser. B, 9: 1–153.

Lucas, M.T. & Dias, M.R. de S. 1976. Peronosporaceae Lusitaniae. *Agron. lusit.* 37: 281–299.

Nannfeldt, J.A. 1979. Elias Fries and mycology. *Symb. bot. upsal.* 22 (4): 24–31.

Osipian, L.L. 1968. Mikoflora Armyanskoi SSR. Vol. 1. Peronosporovye griby. Mitk, Erevan.

Pyldmaa, P. 1967. Fitopatogennye Mikromitsety Severnoi Estonii. Valgus, Tallin.

Skalický, V. 1966. Taxonomie der Gattungen der Familie Peronosporaceae. *Preslia* 38: 117–129.

Stanevičiene, S. 1984. Peronosporovye griby Pribaltiki. Mokslas, Vilnius.

Tai, F.L. 1979. Sylloge fungorum sinicorum. Science Press, Peking.

Trotter, A. 1926. Peronosporaceae. In Saccardo, P.A., Sylloge Fungorum. Vol. 24: 33–67. Pergola, Avellino

Ulvinen, T., Ohenoja, E., Ahti, T. & Alanko, P. 1981. A check-list of the fungi (incl. lichens) of the Koillismaa (Kuusamo) biological province, N.E. Finland. *Oulanka reports* 2: 1–64.

Unger, F. 1833. Die Exantheme der Pflanzen. Carl Gerold, Wien.

Unger, F. 1836. Ueber den Einflu*ß* des Bodens auf die Vertheilung der Gewächse, nachgewiesen in der Vegetation des nordöstlichen Tirol's. Rohrmann und Schweigerd, Wien.

Unger, F. 1847. Beitrag zur Kenntniss der in der Kartoffelkrankheit vorkommenden Pilze und der Ursache ihres Entstehens. *Bot. Ztg.* 5: 305–317.

Vasyagina, M.P., Byzova, Z.M. & Golovenko, I.I. 1977. Nizshne griby i mikromitsety (Phycomycetes et Myxomycetes). Nauka, Alma-Ata.

Yadav, A.S. 1966. The ecology of microfungi on decaying stems of *Heracleum sphondylium*. *Trans. Br. mycol. Soc.* 49: 471–485.

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TULOSTOMA PSEUDOPULCHELLUM SP. NOV. (TULOSTOMATALES, GASTEROMYCETES) AND ALLIED SPECIES

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Abstract: *Tulostoma pseudopulchellum sp.nov.* is fully described and compared with *T.pulchellum* Sacc., *T.poculatum* White and *T.minutum* White. *T.hollosii* Moravec is made a synonym of *T.subfuscum* White, and the new combination *T.pulchellum var. subfuscum* (White) is proposed. Macro- and microscopic features are illustrated with photographs.

Key words: Taxonomy, chorology, *Tulostoma pseudopulchellum, T.pulchellum, T.subfuscum, T.hollosii, T.poculatum, T.minutum, Gasteromycetes.*

Tulostoma is a very attractive genus of *Gasteromycetes* since its more than 100 species distributed throughout most of the world, presents a great taxonomic complexity. All efforts to elucidate this problem are specially interesting. In this regard, WRIGHT´S (1987) monograph paved the way for future studies.

The present paper is included in the line of research that the authors are currently pursuing, viz. the comparative study of the species of *Tulostoma* from the chalky-gypsum communities of Madrid (Spain) with those fruiting in desertic and semidesertic zones of Baja California (Mexico). The studies concerning Mexico have been published by MORENO *et al.* (1991), and those corresponding to Spain begin with this contribution.

MATERIAL AND METHODS

The material of *T.pseudopulchellum* studied is deposited in the Herbarium of the Departamento de Biología Vegetal (Botánica), Universidad de Alcalá de Henares, Spain (AH); the remaining collections are from the Herbarium of the National Museum, Prague, Czechoslovakia (PRM), from the Universidad de Baja California, Mexico (BCMEX), from the University of Tel-Aviv, Israel (TELA), and from the New York Botanical Garden, U.S.A. (NY).

Photomicrographs of spores were made with a Zeiss-DSM 950 S.E.M., and those of the capillitia with a Labophot Nikon photomicroscope. The procedure followed for the preparation of samples has been described by MORENO *et al.* (*loc.cit.*).

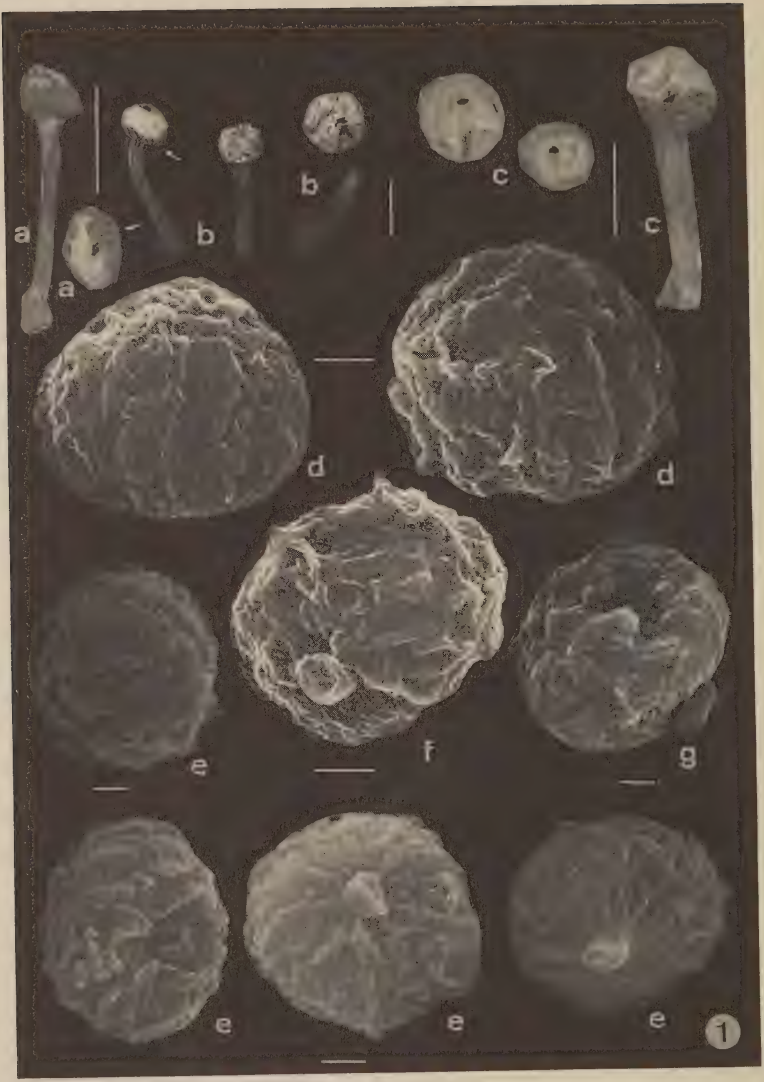
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Fig.1. *Tulostoma pseudopulchellum*: fruit-bodies and spores (a. AH 11975; b. AH 11603; c,f. AH 11699; d. AH 11822; e. AH 11605 -*holotypus*-; g. AH 13106).

Tulostoma pseudopulchellum Moreno, Altés & Wright *sp. nov.*
(Figs. 1-13)

Material studied: España: Finca La Oruga, Alcalá de Henares, Madrid, in loamy gypsum soil with *Stipa tenacissima*, 15-X-1986, *leg.* C. Illana, AH 11644; *ibid.*, 21-X-1987, *leg.* G. Moreno, C. Illana, M. Heykoop & F. Esteve, AH 12956; near Cerro Malvecino, Alcalá de Henares, in loamy gypsum soil with *Salsola vermiculata* and *Kochia prostrata*, 2-XI-1986, *leg.* M. Heykoop, AH 12957; *ibid.*, III-1989, AH 11603 and 11605 (*holotypus*); *ibid.*, 3-XI-1989, *leg.* G. Moreno, J. L. Manjón & A. Altés, AH 11699, 11703 and 11758; *ibid.*, 5-XII-1989, *leg.* A. Altés, J. L. Manjón & G. Moreno, AH 11749, 11821 and 11822; *ibid.*, 2-II-1990, *leg.* G. Moreno & A. Altés, AH 11965, 11968, 11975 and 11977; *ibid.*, 1-III-1991, *leg.* Dpto. de Botánica (Univ. Alcalá), AH 13106, 13107 and 13108.

Sacculo sporifero 5-10 mm diam., globoso vel subgloboso. Exoperidio valde membranoso, in squamulis secedentes, ad basim persistentes. Endoperidio laevi, albo. Ore fimbriato, haud prominente. Collo inconspicuo. Gleba ferruginea. Stipite (11-)14-20(-25) x 1.5-2.5(-3) mm, albo cremeo vel dilute brunneo, fibroso, longitudinaliter sulcato, basis cylindracea vel leniter bulbosa.

Sporis globosis, 4-5.7(-6.2) μm diam., flavis, sublaevis vel parce verrucosis sub lente; sub microscopio electronico collapsantes, foedentibus, sculptura indefinita, superficie rugosa verrucis interdum sejunctis, cristis irregularis efformantibus. Capillitio hyalino vel flavo, usque ad 5.5 μm diam., parietibus tenui vel crassitunicatis, leviter incrassatis ad septis brunneis usque 7 μm diam.

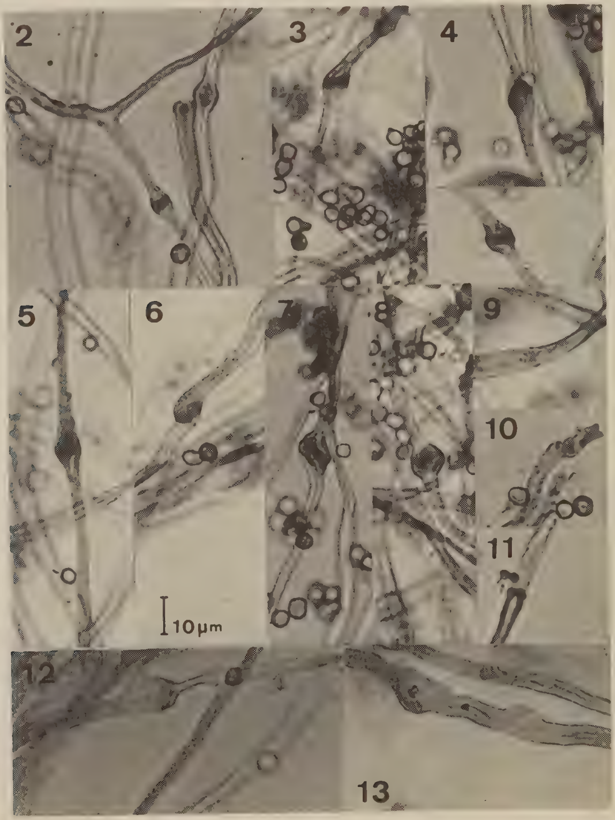
Holotypus: Cerro Malvecino, Alcalá de Henares, Madrid, Spain,
in AH 11605 *conservatus est.*
Paratypus in MA-fungi *et* BAFC.

Spore-sac globose to subglobose, 5-10 mm diam. Exoperidium distinctly membranous covered by a layer of soil, whitish to greyish, sloughing off in patches of variable size, persisting in the lower third. Endoperidium smooth, white to dirty white, often soiled by clay particles. Mouth fimbriate, not conspicuous. Socket obscured by the soil that covers it. Gleba ferrugineous. Stipe (11-)14-20(-25) x 1.5-2.5(-3) mm, whitish cream to light brown, fibrous, longitudinally sulcate, with a cylindric or only very slightly bulbous base.

Spores globose, 4-5.7(-6.2) μm diam., yellowish, subsmooth or only very slightly verrucose when viewed under the L.M.; under S.E.M. they appear ugly through collapsation and by exhibiting an indistinct, usually wrinkled surface which may appear at times covered by some plates; however, more or less independent verrucae may occasionally be seen, as well as very irregularly arranged cristae. Capillitium hyaline to slightly yellowish, up to 5.5 μm diam., walls of varied thickness, branched, with brownish slightly thickened septa, which may reach 7 μm broad. Endoperidium formed by hyphae similar to those of the capillitium, 1.5-4.5 μm diam., not much broadened at the uncolored septa.

Remarks: *T. pseudopulchellum* is characterized by a correlation of features such as its small size, practically plane fimbriate mouth, stem hardly bulbous at the base, spores with an ill-defined ornamentation under S.E.M. as seen in all the collections studied in different stages of development, and the habit among steppe hills with loam-clayish soil with some gypsum, growing somewhat isolated together with *Chenopodiaceae* (mainly *Salsola vermiculata* and *Kochia prostrata*).

It is close to *T.pulchellum* which it resembles macroscopically to the point of confusing it with that species on first sight; they differ, however, by *T.pulchellum* exhibiting a distinct and well delimited, mammose mouth, stem frequently enlarged towards the base, and spores with a well defined and very characteristic spore ornamentation under S.E.M., formed by wide and plane verrucae (fig.14).



Figs.2-13. *Tulostoma pseudopulchellum*: capillitium, capillitial septa and spores (2-8, AH 11605 -*holotypus*-; 9-11, AH 11603; 12-13, AH 11758).

In addition, we have compared the proposed species with the types of *T. poculatum* and *T. minutum* (fig. 14c,d). The result shows that they are very similar to *T. pulchellum* regarding their main features, and so they are considered synonymous with the latter. This has been already pointed out in WRIGHT (*loc. cit.*). The type of *T. poculatum* belongs to the collection Bates 462, Long Pine, Nebraska, U.S.A., as it was published in WHITE (1901). We must remark that this type collection consists of 8½ fruit bodies and one of them belongs to *T. striatum* indeed; the rest of the fruit bodies fit the original description (WHITE, *loc. cit.*).

Regarding *T. hollosii* Moravec, on the basis of the study of the holotype (WRIGHT, 1987) as well as other collections at PRM, it exhibits macroscopic features coincident with those of *T. pulchellum* and *T. subfuscum* White. Under S.E.M., the spore ornamentation of *T. hollosii* has narrower and not so flat verrucae as in *T. pulchellum* but rather more prominent and forming frequent cristae of variable length (fig. 15c). This type of spore ornamentation is similar to that observed in some collections of *T. subfuscum* studied from Israel and Mexico (figs. 15d, e). However, WRIGHT (*loc. cit.*; *pl.* XVII.5) has observed spores with an ornamentation intermediate between *T. subfuscum* and *T. pulchellum* with flattened verrucae and cristae. We have not observed any important differences in the capillitia.

For these reasons we believe it is best to treat *T. hollosii* as a synonym of *T. subfuscum*, and the latter as a mere variety of *T. pulchellum*, possibility which was pointed out by WRIGHT (*loc. cit.*). In a previous paper, MORENO *et al.* (*loc. cit.*) admitted a wider concept of *T. pulchellum*, with greater variability of spore ornamentation.

In short, the taxonomic conclusions concerning *T. hollosii* and *T. subfuscum* are as follows:

1.- *Tulostoma pulchellum* Sacc., Bull. Soc. Mycol. France 5: 118, tab. XIV, fig. 4 (1889).

2.- *Tulostoma pulchellum* Sacc. *var. subfuscum* (White) Wright, Moreno & Altés *comb. nov.*
≡ *T. subfuscum* White, Bull. Torrey bot. Cl. 28(8): 433, pl. 34, figs. 10-12 (1901).
= *T. hollosii* Moravec, Preslia 28: 36-37 (1956).

Material studied: EUROPE. Czechoslovakia: Záhori, Malacky, *T. pulchellum var. subfuscum* PRM 583339 (as *T. hollosii*). NORTH AMERICA. Mexico: Baja California, *T. pulchellum* BCMEX 1794 and 1802; *ibid. T. pulchellum var. subfuscum* AH 12967 (as *T. pulchellum*). U.S.A.: Nebraska, Long Pine, *T. poculatum* Herb. Bates 462 (NY); Colorado, *T. minutum* NY. ASIA. Israel: Ramat Hasharon, *T. pulchellum var. subfuscum* TELA 77g38 (as *T. subfuscum*); Rehovot, *T. pulchellum var. subfuscum* BAFC ex LG (as *T. pulchellum*).

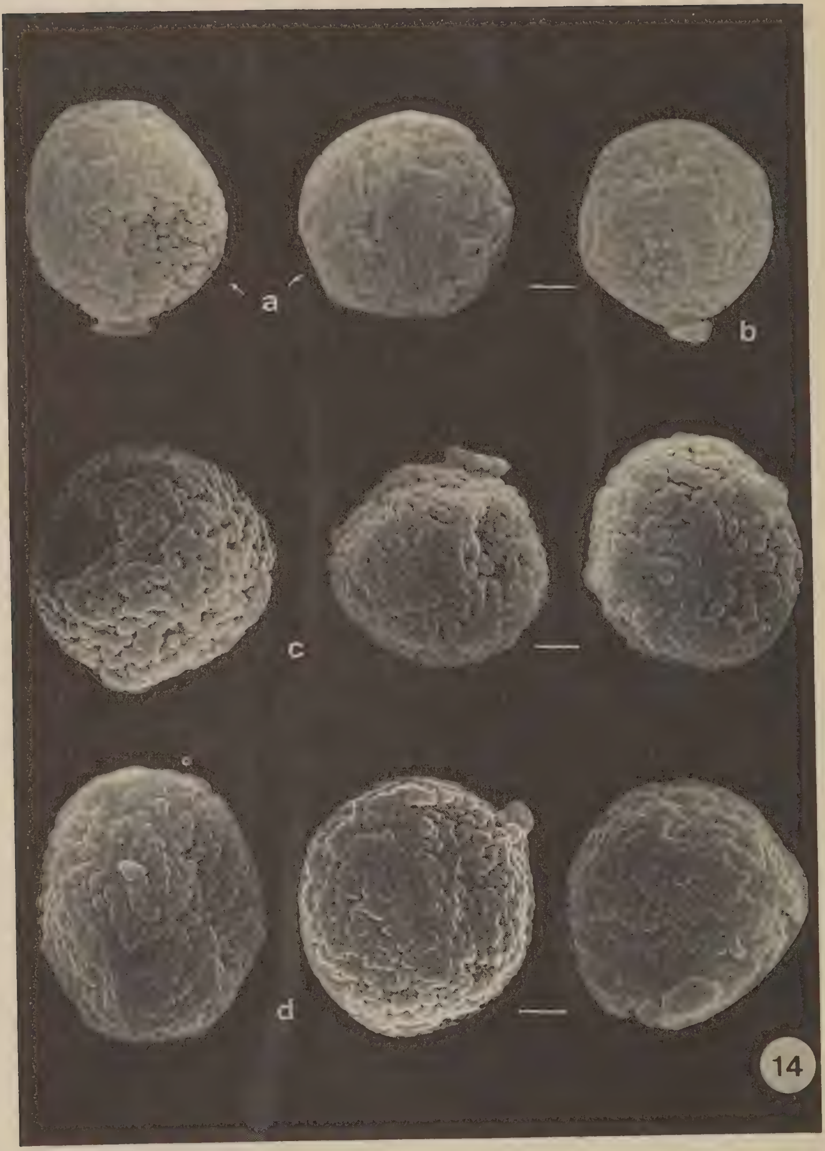


Fig.14. *Tulostoma pulchellum*: spores (a. BCMEX 1794; b. BCMEX 1802; c. Herb.Bates 462 [NY] - *typus* of *T.poculatum*; d. NY - *typus* of *T.minutum*).

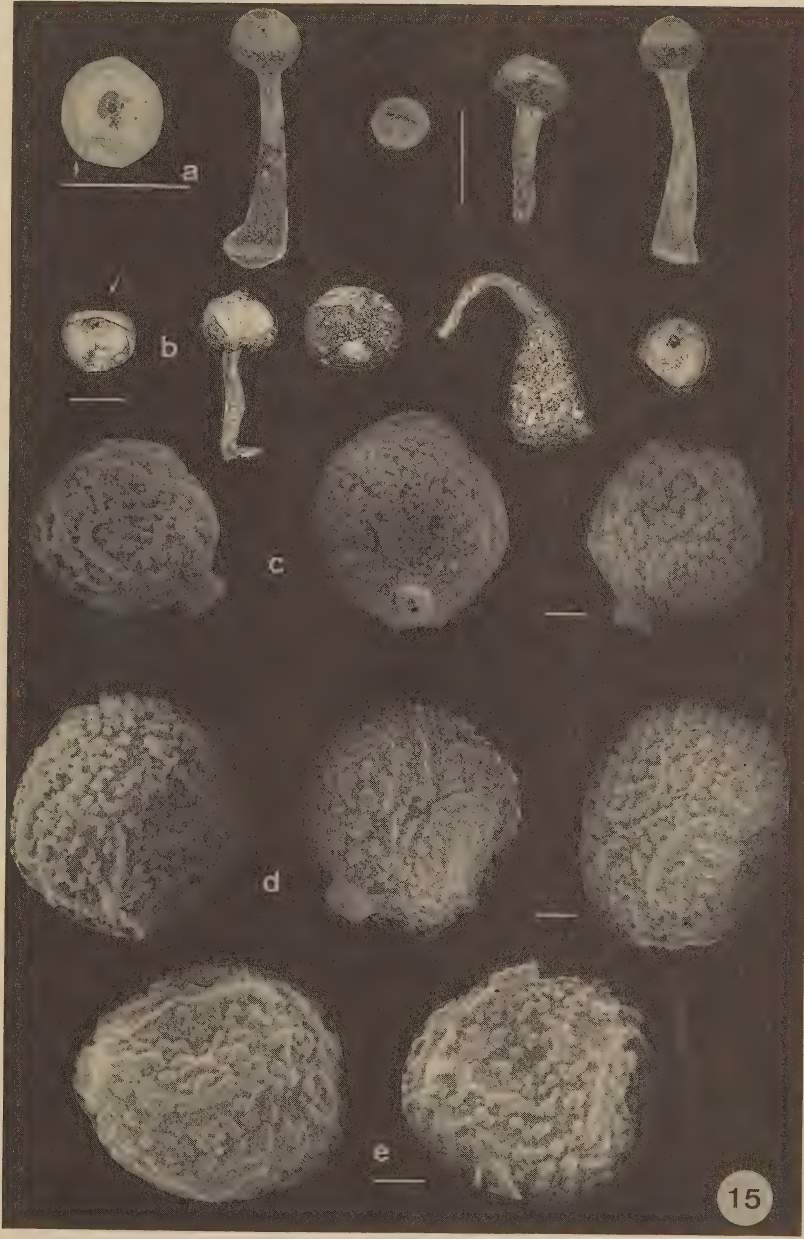


Fig.15. *Tulostoma pulchellum var. subfuscum*: fruit-bodies and spores (a,c. PRM 583339 as *T.hollosii*; b,e. AH 12967 as *T.pulchellum*; d. TELA 77g38 as *T.subfuscum*).

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LITERATURE

Moreno,G., A.Altés, C.Ochoa, N.Ayala & J.E.Wright (1991). The genus *Tulostoma* in Baja California, Mexico. *Mycologia* (in press).

White,V.S. (1901). The *Tylostomaceae* of North America. *Bull.Torrey Bot.Club* 28:421-444.

Wright,J.E. (1987). *The genus Tulostoma (Gasteromycetes). A world monograph.* Biblioth. Mycol. 113. J.Cramer, 338 pp.

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PANNOPARMELIA ANZIOIDES: A TAXONOMIC SYNONYM OF PANNOPARMELIA ANGUSTATA (PARMELIACEAE, LICHENES)

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ABSTRACT

Our studies on collections from Argentina, Chile and New Zealand led us to conclude that **Pannoparmelia anzioides** Darbishire is actually a taxonomic synonym of **P.angustata** (Persoon in Gaudichaud) Zahlbruckner, since the separation of the former was merely based on morphological characteristics that are included in the variability range of **P.angustata.** The description of the species is emended and its geographical distribution is enlarged.

INTRODUCTION

Pannoparmelia anzioides was described by Darbishire based on material collected by Dr. Skottsberg during his trip with the Antarctic Expedition (1901-1903). He considered the new species closely related to **P.angustata** (Pers.in Gaud.) Zahlbr., and differentiated from the latter by the endings of the thallus "*narrower and* *constricted in a characteristic manner*" (Darbishire, 1912).

In his studies on **Anzia** and **Pannoparmelia** from New Zealand, Galloway (1978, 1985) compares briefly both species, stating that **P.anzioides** has "*wider lobes which are less divided and constricted, pointed apices and a thalline exciple which lacks tomentum*".

Recently Yoshimura (1987) also made some comments on **P.anzioides** stating that the characteristics separating it from **P.angustata** are "*wider lobes...never moniliform ...spongiostratum more or less continuous although each portion may be distinguished*".

P.anzioides which is considered a South American species (Galloway, 1978, 1985) was collected in the Argentinian Provinces of Tierra del Fuego (Darbishire, 1912) and Río Negro, Neuquén and Chubut (Lamb, 1958). On the other hand **P.angustata** is considered an Australasian species (Galloway, 1978, 1985; Kantvilas et al., 1985).

Darbishire (1912) stated that the material he was using for the diagnosis of **P.anzioides** would *"find a permanent resting place in the Herbarium of the Royal Botanic Garden of Kew (England)*". But, so far it could not be found neither at K (Lucas, G.L., 1991, pers.comm.), at BM (Galloway,D.J.,1991, pers.comm.), nor at BRIST (Brown,D.H., 1991, pers.comm.). For this reason it is not possible until now to verify the diagnosis with the original material. The only elements available to judge upon are the illustrations published by Darbishire (1912, Fig.22, Pl.2 and Fig.1, pag.12). Regarding **P.angustata** it was not possible up to now to find the "type" material neither at Paris, PC (Lacoste,L.,1991, pers. comm.), at LG (Sérusiaux, E., 1991, pers. comm.), at L (Audiffred, P., 1991, pers. comm.), nor at DS (Bourell, M., 1991, pers. comm.).

The present paper is based on studies of collections made in **Nothofagus** forests of Argentina, Chile and New Zealand.

MATERIALS AND METHODS

The study is based on collections in **Nothofagus** forests of Nahuel Huapi National Park and surroundings, in areas described in a previous paper (Calvelo and Lorenzo, 1989), and Tierra del Fuego. The specimens are deposited with the Herbarium of the Centro Regional Universitario Bariloche (BCRU), Calvelo´s private herbarium and BAFC. Additional collections are being sent to BM, ANUC and ASU. Material from similar Chilean forests (loan from BM) and from New Zealand (loan from CHR) were examined.

The specimens from New Zealand have been previously studied by D.Galloway and determined as **P.angustata.**

Spores and conidia were measured after mounting in KOH 5% and stained with phloxine 1%.

Identification of lichenic substances was achieved by microcrystal tests and TLC (Culberson,C.F., 1972; Culberson,C.F. & K.Ammann, 1979). To achieve a good microcrystallization, the spongiostratum was scraped away with a razor blade.

Macrophotograph were taken with a Nikon camera and microphotographs were taken with an Olympus camera on Stereo Zoom 7 Baush & Lomb dissecting microscope and Olympus BH 2 microscope.

DISCUSSION AND TAXONOMIC STATEMENT

Table 1 comparatively summarizes the differential features between **P.angustata** and **P.anzioides** pointed out by different authors, as detailed in the Introduction.

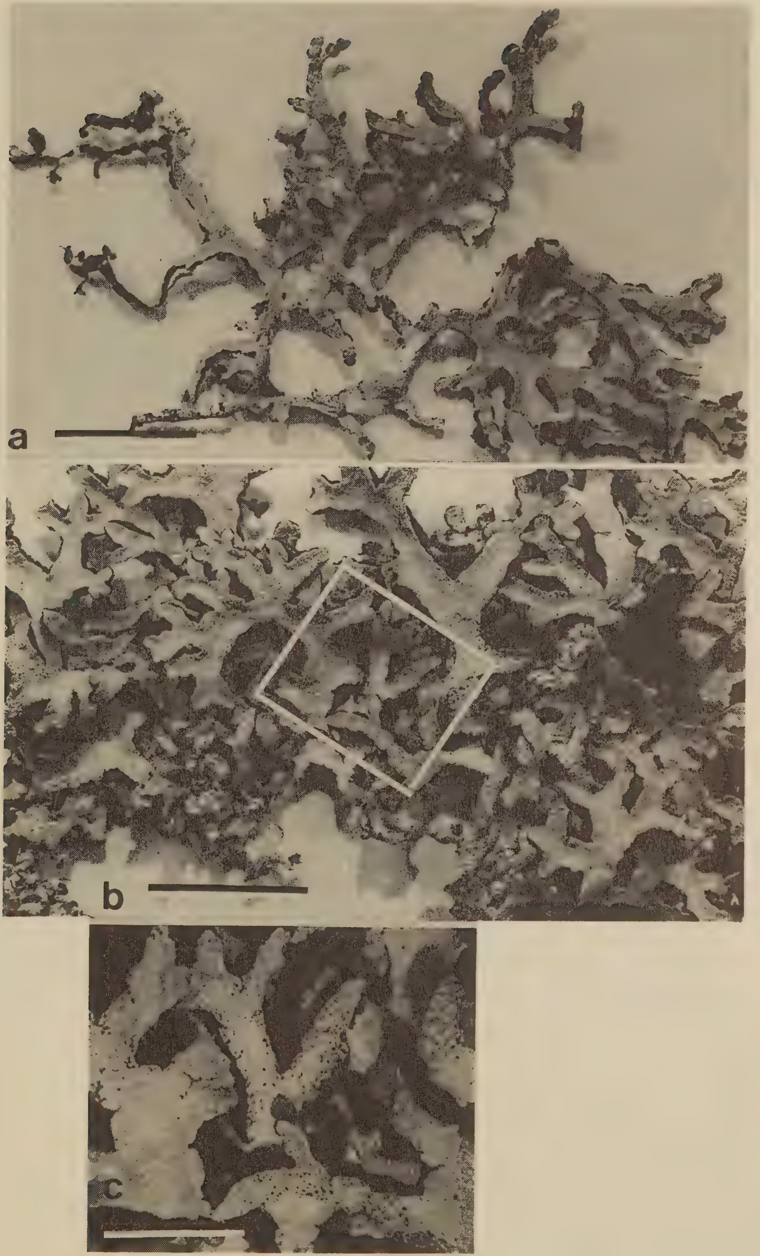
As it may be observed these comparisons are based only on morphological differences, overlooking anatomical and/or chemotaxonomical characteristics.

For the reasons stated in the Introduction, it was not possible to study the "type" specimen of **P.anzioides.** Nevertheless we examined 10 col-

	P.angustata	**P.anzioides**
Lobes	linear or often constricted moniliform with narrow endings, moderately to densely branched	wider, less divided and constricted; pointed apices;never moniliform
Spongiostratum cushions	globose and moniliform	more or less continuous, although each portion may be distinguished
Thalline exciple	dark brown tomentose	lacking tomentum

Table I- Comparative summary of differential features between **P.angustata** and **P.anzioides** extracted from Darbishire (1912), Galloway (1978, 1985) and Yoshimura (1987).

Fig. 1- General aspect of the **Pannoparmelia anzioides-angustata**-complex, showing different forms of lobes and apices. a- BAFC 36754, scale 1 cm. b- BCRU 00241, scale 1 cm. c- Detail of Fig. 1b (rectangle) showing lobes, scale 0.5 cm.


a
b
c

lections from Patagonia (Argentina), 3 from Patagonia (Chile) and 4 from New Zealand. They show morphological characteristics that fit with the description of **P.anzioides** as well as with that of **P.angustata**, as explained below:

Lobes

a-linear, moniliform and intermediate forms are found on the same thallus (Fig.1 a,b,c).

b-rounded and/or pointed apices are found on the same thallus (Fig. 1 a,b,c).

Spongiostratum cushions

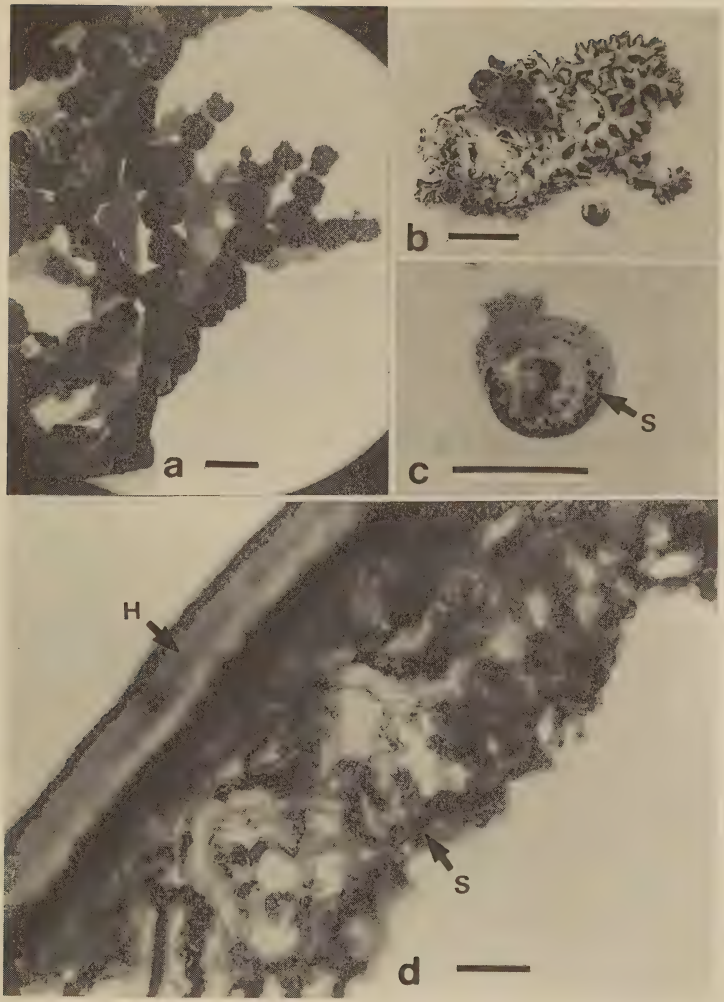
globose, moniliform and well separated are found together with more or less continuous ones and intermediate forms (Fig.2 a).

Thalline exciple

a-Our anatomical studies have shown that the structure of the thalline exciple that has been formerly called tomentum, is in fact, spongiostratum (Fig. 2 d), identical to that of the lower surface of the thallus : a conspicuous spongy hypothallus composed of a network of hyphae several cells thick (Henssen and Dobelmann, 1987).

b-Apothecia with or without spongiostratum are found on the same thallus. Furthermore the spongiostratum frequently has an uneven development on a single apothecium, and may be abundant on one side and lacking on the other (Fig.2 b,c).

Fig.2 a- Lower surface of thallus of the **Pannoparmelia anzioides-angustata**-complex; spongiostratum cushions; BAFC 36754, scale 0.5 cm. b-Thallus with apothecia; one apothecium separated from the thallus (arrow); BAFC 36754, scale 1cm. c- Lower view of separate apothecium of Fig. 2 b, showing an incomplete crown of spongiostratum on lower part of excipulum. d- Transverse section of the apothecium, h: himenium, s: spongiostratum, scale 100 µm


b
S
c
a
H
S
d

Anatomy

No significative differences were found on thallus, and apothecia between the studied collections.

Asci, ascospores and conidia

No significative differences were found between the studied collections.

Chemistry

All collections have been studied by microcrystallization and TLC revealing identical chemical composition: divaricatic acid (major) and usnic acid (minor to trace).

These reasons clearly rule out the possibility of a segregation of two different taxa.

Thus, **P.anzioides** is added to the list of synonyms of **P. angustata** published by Galloway (1978, pag.264).

We agree with Galloway's statement (1978): **P.angustata** "*...is a rather variable species and can show differences in morphology which appear to correlate with changes in microclimate and/or substrate*" (Galloway,1978). He mentions variability in colour of upper cortex, number of apothecía and pycnidia and hypothallus colour.

Field evaluations allow us to consider that the narrower lobes are typical of the shadest habitats (non decidous forests), whereas wider ones appear on individuals from full sunlight habitats (canopy, forest margins, deciduous forests). In addition the development of the spongiostratum on the lower surface and on the thalline excipulum seems to be influenced also by microhabitat conditions.

Based on the above results an emended description of the species, including the variability introduced is given.

Pannoparmelia angustata (Pers. in Gaudichaud) Zahlbr. emend. Calvelo & Adler
= **Pannoparmelia anzioides** Darbishire, Wissenschaftliche Ergebnissen der Swedischen Südpolar-Expedition 1901-1903 (Ed. O. Nordenskjold) 4(2): 11. P.A. Norstedt, Stockholm (1912).
For the complete list of synonymes see Galloway, 1978, pag. 264.

Thallus corticolous; orbicular to spreading, up to 8 cm diam.. Lobes elongate, up to 20 mm long, 1.0-2.5 (-3.0) mm wide, linear with pointed or constricted (moniliform) apices; moderately to densely subdichotomously to dichotomously branched. Upper surface yellowish-green to greenish, matt, smooth, without isidia, soredia or pseudocyphellae. Medulla white. Lower surface white, shining, smooth, occasionaly visible between the spongiostratum cushions and at lobe tips. Spongiostratum moniliform, up to 1.0 mm thick, reddish-brown to black, visible beyond the lobe margins. Rhizines frequent, simple, up to 1.3 mm long, with a tuft at the apex, born singly at the borders of the spongiostratum cushions. Apothecia frequent,very rarely absent; circular, 2.1-3.5 (-5.0) mm diam., pedicellate, first cupuliform, plane to convex and lacerate when mature; disc light brown to brown; thalline exciple concolorous with the thallus and smooth on the upper part, whitish, warted and with or without spongiostratum at the lower part (the spongiostratum may form a crown all around the exciple or just cover a part of it). Asci claviform, 8-spored, 30-34 x 14-16 µm. Ascospores hyaline, round to ellipsoid, unicellular, 6.0-6.5 µm diam.,with thick epispore. Pycnidia present, abundant, punctiform, black, laminal, frequently submarginal. Conidia cylindric to slightly fusiform,5.0-6.5 µm long.

Chemistry:cortex K-; medulla K-,C-,KC-,P-;divaricatic acid (major), usnic acid (minor to trace).

Distribution and Ecology Circumantarctic: New Zealand; common and widespread in Tasmania (Kantvilas, 1985); Chile; not frequent in Argentinian **Nothofagus** forests: on **Nothofagus dombeyi, N.pu-**

milio and **N.antarctica**, growing intermixed with **Hypogymnia lugubris** and **Menegazzia** sp.. Heliophilus, more frequent at forests margins, canopy and deciduous forests.

Specimens examined: ARGENTINA. Prov. de Río Negro; Dpto.Bariloche; Bariloche, Arroyo Casa de Piedra, on **Nothofagus dombeyi**, 3-III-1991, Calvelo, # 439; BCRU 00242; BAFC 36754; 12-V-1991, Calvelo, # 455; BCRU 00238. Llao-Llao, costa del Lago Moreno, on **N.dombeyi**, 23-III-1990, Calvelo # 426, BCRU 00240. Parque Nacional Nahuel Huapi, Puerto Blest, way to Arroyo Los Cántaros, on **N. dombeyi**, 12-III-1991, Calvelo, # 437; BCRU 00239. Cerro Bella Vista, 1350 m above sea level, on **N.pumilio**, 27-I-1990, Calvelo #425, BCRU 00241. Tierra del Fuego, Pampa de los Indios. Ruiz,L., I-1989, BAFC 36742. CHILE. Patagonia; Fjordo Andrew, 50º 25.0'S: 73º 39.5'W, on **N. antarctica**, 24-XI-1985, Newton, A., BM L91, L93b. Prov. de Magallanes, Río Rubens, on **N.pumilio**, 12-I-1941, R.Santesson BM 417. NEW ZEALAND. Lewis Pass, Healy, A., 11-X-1960, on **Nothofagus sp.** CHR 160270, Galloway, D., 6-II-1976, on **Leptospermum sp.**, CHR 378690. West Otago, Dart Valley, Child, J., 24-I-1970 CHR 37589. W. Peel, Galloway, D. 21-III-1979, on bush CHR 348320.

CONCLUSION

Pannoparmelia anzioides is considered a taxonomic synonym of **P.angustata:** the separation of the former was merely based on morphological features included in the range of variation of the latter. Thus, the genus has only two valid species:

- **P.angustata** with circumantarctic distribution (Australasia- Southern South-America)
- **P.wilsonii** (Räsänen) Galloway, apparently the isidiate morph of **P.angustata** recorded from Australasia (Galloway, 1978).

Pannoparmelia cannot longer be considered a genus with vicariant species between Australasia and Southern South-America (Galloway, 1987). However **P.angustata** is one further evidence of the late relationship between these territories as old parts of Gondwanaland (Galloway, 1987; Calvelo and Lorenzo, 1989) and of the similarity of cool temperate **Nothofagus** forest lichenic flora.

ACKNOWLEDGEMENTS

We thank Dr. Jorge E. Wright and Dr. Gernot Vobis for valuable discussions and suggestions and for corrections to the manuscript. We are also indebted to Drs. P.Audiffred, M. Bourell, D. H. Brown, D. Galloway, L. Lacoste, G. Lucas and E. Sérusiaux for important assistance during the searching of original material; and to the Keepers of BM and CHR for the loan of collections from Chile and New Zealand respectively.

REFERENCES

Calvelo,S. & L.Lorenzo. 1989. Noteworthy corticolous lichens in **Nothofagus** forests, North- Western Patagonia. Mycotaxon 34(2): 655-665.

Culberson, C. F.. 1972. Improved conditions and new data for the identification of lichen products by standardized thin layer chromatographic method. J.Chromatogr. 72: 113-125.

Culberson, C.F.& K.Ammann. 1979. Standarmethode zur Dünnschichtchromatographie von Flechtensubstanzen. Herzogia 5:1-24.

Darbishire, O..1912. The lichens of the Swedisch Antarctic expedition. In (Nordenskjöld, O. Ed.): Wissenschaftliche Ergebnisse der Swedischen Südpolar expedition 1901- 1903: 4, Liefer 11. Nordstedt, Stockholm: 1-74.

Galloway, D. 1978. **Anzia** and **Pannoparmelia** (Lichens) in New Zealand. Jour. of Bot. 16: 261-270.

Galloway,D. 1985. Flora of New Zealand: Lichens. Hasselberg, Government Printer, Wellington, New Zealand.

biogeographical problems. In: Progress and problems in Lichenology in the eighties. Bibl. Lichenol. 25:385-399.

Henssen, A. and A.Dobelmann, 1987. Development of the spongiostratum in **Anzia** and **Pannoparmelia.** In: Progress and Problems in lichenology in the eighties. Bibl. Lichenol. 25:103-108.

Kantvilas,G.; P.W.James & S.Jarman. 1985. Macrolichens in Tasmanian rainforest. Lichenologist 17 (1):67-83.

Lamb,I.M.. 1958. La vegetación liquénica de los Parques Nacionales Patagónicos. Anales de Parques Nacionales; VII. Buenos Aires.

Yoshimura,I. 1987. Taxonomy and speciation of **Anzia** and **Pannoparmelia.** In: Progress and problems in Lichenology in the eighties Bibl. Lichenol. 25:185-195.

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BOOK REVIEWS

L. M. Kohn, Book Review Editor

Mushrooms of North America, by Roger Phillips. 319 pp., 290x215 mm, 1991. Little, Brown & Company, 200 West St., Waltham, Massachusetts 02154. Hardcover, ISBN 0-316-70612-4, US $39.95, CAN $49.95. Paper, ISBN 0-316-70613-2, US $24.95, CAN $32.00.

This newest addition to the growing number of "mushroom" guidebooks for North America is certainly worth the modest price. The format is nearly identical to Mr. Phillips's popular field guide "Mushrooms and other fungi of Great Britain & Europe," where each species, usually consisting of many fruiting bodies in various stages of development, is photographed on a solid pastel backdrop. This style of presentation is visually striking and attractive. The title page boasts that this picture book is "the most comprehensive mushroom guide ever, with over 1,000 color photographs." Indeed, there are more colored photographs of species of mushrooms than any other book of its kind on the market today for North America. The quality of the photographs is excellent, while the accuracy of the identifications, for the most part, is exceptionally high.

The bulk of this field guide, 287 pages, is devoted to illustrations and descriptions of Basidiomycetes, with 189 pages just on agarics. Only 13 pages are allocated to the Ascomycetes. This manual was surely not designed for the novice. Little information and no illustrations on the biology and salient morphological features of the fleshy fungi are provided. Thus, lacking a means of learning common morphological features of fungi, it will be difficult for the uninitiated to make effective use of the written descriptions in order to confirm visually matched identifications. Because there are a number of other good field guides on the market which cover these essential topics, this fault is not a major handicap to this well illustrated guide.

Since a large and diverse number of agaric species are illustrated, Phillips's **Mushrooms of North America** serves nicely as a reference to which one can send students for independent confirmation of their identifications. This technique worked well during my summer field mycology course. In this respect, I find three features worthy of praise: the large number of *Russula* species included, the large number of *Cortinarius* species included, and the comment section found at the end of many of the descriptions.

From a scientific standpoint, the book does have shortcomings. There are some irregularities in the text and a few mistakes in identifications which are unfortunate. For instance, it has been a great many years since *Flammulina velutipes* was placed in the genus *Collybia* (p. 62). The correct name for *Cyptotrama chrysopeplum* (p. 63) is *C. asprata* (Redhead & Ginns, 1980; Singer, 1986) and has been labelled as such by attending mycologists at forays over the past several years. The photograph identified as *Boletus auriporus* (p. 220) is actually *B. atkinsonianus* (even though the spore measurements given are identical to those for *B. auriporus* found in Smith & Thiers, 1971 - but see below). *Pleurotus elongatipes* (p. 207) is a synonym of *Hypsizygus tessulatus* (Redhead, 1986) and if Mr. Phillips's measurements of basidiospores are accurate, then his photograph of *H. tessulatus* is actually *Hypsizygus ulmarius*. There are a few other similar problems with identifications, but by far the majority of the species of agarics and boletes appear to have been identified correctly. I do find it curious, however, that many of the spore measurements given in this work are exactly the same measurements found in previously published descriptions in other field guides and monographs. In addition, the measurements and color terminology used to describe the fruiting bodies often closely resemble descriptions published elsewhere by various authors, with a few minor changes. For some reason, something about these observations bothers me.

A truly disturbing point, however, is the introduction of a superfluous new combination in the genus *Phylloporus*, i.e., *Phyloporus foliiporus* (Murrill) Phillips & Kibby (p. 216). This combination was published validly, using the correct basionym, by Singer in 1978 (PERSOONIA 9:424). Nomenclatural problems in the boletes and agarics are considerable enough without untrained individuals adding to the confusion in the scientific literature.

The positive points of this identification manual far outweigh the negative ones. Without a doubt this book is the most extensive and clearly presented color picture guide currently available for aiding one in identifying mushrooms of North America. *T. J. Baroni, Department of Biological Sciences, SUNY - College at Cortland, New York, U.S.A.*

Conidial Fungi of Cuba I and **II**, by R. F. Castañeda Ruiz and Bryce Kendrick. Softcover (paper), University of Waterloo Biology Series Nos. 32 and 33, 53 and 61 pp., respectively, 1990. Available from Mycologue Publications, 331 Daleview Place, Waterloo, Ontario, Canada N2L 5M5. ISSN 0317-3348. CAN $15.-- the pair.

These, the first two issues in a planned series of contributions to our knowledge of the conidial mycota of Cuba, result from collaboration of Cuban and Canadian mycologists and appear to be based on extensive field work on the island. In these initial volumes a substantial number of new taxa are described and illustrated, while records of many other conidial fungi not known previously to occur in Cuba are reported. All told, fourteen new anamorph genera and thirty new anamorph species are described. In addition, seventeen fungi are reclassified and fifty-six species are recorded from Cuba for the first time.

The notion that mycology remains in an age of discovery is well reflected in the number of novel anamorphs encountered. Considering the many hundreds of Hyphomycete genera described hitherto, and the astonishing range of their morphology, it seems nothing short of amazing that so many new and varied forms continue to be found. Quite clearly, as the authors of these publications state, a rich and previously little known anamorph mycoflora exists in Cuba and, although some of the fungi treated may be endemic to the island, it is reasonable to assume that a comparable diversity of Hyphomycetes occur in the barely explored Neotropics, many of them undescribed. Perhaps all this is not that surprising considering the estimates of the numbers of fungi made recently by D. L. Hawksworth in his 1990 presidential address to the British Mycological Society. The conservative estimate that 1.5 million exist, of which only about 69,000 are known, that is 4 to 5%, allows us a daunting perspective on how many more remain to be discovered. They clearly number in the hundreds of thousands! All this after over two centuries of assiduous collecting and describing. At this rate, as Hawksworth points out, it will take another eight hundred years and more to document all the fungi presumed to exist. With a drastically declining population of systematic mycologists it now seems well nigh certain that the task may never be completed. With the rapid destruction of habitats, paraticularly the rain forest, numerous presently existing fungi will become extinct even before they are discovered.

In these volumes a further small but significant dent is made in our ignorance of extant Hyphomycetes. It is perhaps ironic that the junior author of these publications, who has long advocated the desirability of reducing the number of recognized Hyphomycete genera, should now find himself co-authoring fourteen new anamorph generic names within this class, all from a relatively small geographic land mass. There are, presumably, more to come. The taxa treated are well described and illustrated. Each description is detailed, giving full particulars of the morphological characteristics of each species, as well as conidiogenesis. Following each generic description useful comparative information is provided indicating differences between the novel taxa and similar genera described previously. The taxonomic decisions made with regard to establishing new taxa and the nomenclatural new combinations proposed appear to be soundly based and well reasoned. The illustrations, in the form of line drawings are, overall, good although in places somewhat rough. They are more than adequate for purposes of readily identifying the taxa described.

These publications are an important addition to the literature on Hyphomycetes and should be in the library of any mycologist likely to be collecting microfungi in the Neotropics. They should be of great interest to students of conidial fungi world-wide. *Gareth Morgan-Jones, Department of Plant Pathology, Auburn University, Alabama, U.S.A.*

Cultural Studies and Identification of Wood-inhabiting Corticiaceae and Selected Hymenomycetes from North America, by K. K. Nakasone. Mycologia Memoir No. 15, published for The New York Botanical Garden in collaboration with The Mycological Society of America. Cloth hardcover, 412 pp., 143x233 mm, 1990. J. Cramer in Gebrüder Borntraeger Verlagsbuchhandlung, Johannesstr. 3 A, D-7000 Stuttgart 1, Germany. (U.S. Agent: Lubrecht & Cramer, R.D. 1, Box 244, Forestburgh, NY 12777) ISBN 3-433-76005-8. DM 150.--, US $105.--.

A technical manual, presenting the features of 277 species grown under specified conditions in the laboratory, the importance of which lies in the need to be able to identify Hymenomycetes from the mycelial and other vegetative cells produced in culture. The description of the features of fungal cultures is the principal focus and it occupies 322 pages. The consistent format for the treatment of each species includes macroscopic features, microscopic features, citation of cultures studied, the species code, and a paragraph entitled Remarks. There are 84 line drawings of distinctive or unusual microscopic features.

The species code is a condensation of the description, where each feature is translated into a number and the numbers arranged in ascending order to form the species code. The species codes for all species are arranged in a table which not only aids in the identification of unnamed cultures but also groups species with similar features, but the format makes the comparison of species awkward. There are 15 small tables which compare and contrast in detail the features of species in selected genera. For many species there are notes which include such topics as a review of the known information on cultural features, sexuality, new substrate and geographic distribution records, a summary of the previously known substrates and distribution records, the distinctive cultural features, contrasts with similar species, and comments on the application or misapplication of scientific names. Eighty-five species are described for the first time in culture and 11 new combinations are proposed.

This book is the most extensive treatment of the cultural features of this group to date. However, the number of species included represents about half the species of Corticiaceae recorded from North America. Thus this book should stimulate interest in the cultural features of the other species.

It makes a significant contribution to our knowledge of this group of fungi and will be extensively used by specialists who have to identify unnamed cultures. The data will also be used by mycologists studying the taxonomy and phylogeny of the Corticiaceae. Because we know so little about the ecology and distribution of many of these species, there is great potential for its integration into biodiversity research and the substantiation of rare and endangered species. *J. Ginns, Centre for Land and Biological Resources Research, Ottawa, Canada.*

MYCOTAXON

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The French Lichen Association

intends to organize at

Paris, May 13-15, 1993

a meeting of international level on the following theme:

Lichenized and Non-Lichenized Ascomycetes
Progress and Perspectives in Systematics

The meeting will propose general lectures,
discussions and a poster session.
For further details please contact:

Association française de lichénologie
Université Pierre et Marie Curie
Laboratoire de Cryptogamie B. P. 33
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